

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Crankshaft Position (CKP)-Camshaft Position (CMP) Correlation Bank 1 Sensor A	P0016	This DTC checks the CAM/CRANK signal correlation	Cam pulse occurred outside the 2nd and 7th medium resolution window		If PCM State is run or crank and medium resolution and low resolution signals are correct and no Cam or Crank faults exist.		Medium resolution interrupt	2 trips Type B
O2S Heater Control Circuit Bank 1 Sensor 1	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity.	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).		Ign Switch position Ignition Voltage	= Crank or Run position 9 volts < Ign Voltage < 18 volts	50 failures out of 63 samples 250 ms /sample Continuous	2 trips Type B
O2S Heater Control Circuit Bank 1 Sensor 2	P0036	This DTC checks the Heater Output Driver circuit for electrical integrity.	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).		Ign Switch position Ignition Voltage	= Crank or Run position 9 volts < Ign Voltage < 18 volts	50 failures out of 63 samples 250 ms /sample Continuous	2 trips Type B
HO2S Heater Resistance Bank 1 Sensor 1	P0053	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	Learned Heater Resistance.	9.3 ohms < Calculated Heater Resistance < 3.13 ohms	No Active DTC's Engine Off Time Valid Coolant – IAT Engine Soak Time Coolant Temp Engine Run Time	ECT_Sensor Group IAT_Sensor Group =TRUE < 8 °C > 28800 seconds -30°C ≤ Coolant ≤ 45°C ≥ 0.13125 seconds	Once per valid cold start	2 trips Type B
HO2S Heater Resistance Bank 1 Sensor 2	P0054	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	Learned Heater Resistance.	21.17 ohms < Calculated Heater Resistance < 8.82 ohms	No Active DTC's Engine Off Time Valid Coolant – IAT Engine Soak Time Coolant Temp Engine Run Time	ECT_Sensor Group IAT_Sensor Group =TRUE < 8 °C > 28800 seconds -30°C ≤ Coolant ≤ 45°C ≥ 0.13125 seconds	Once per valid cold start	2 trips Type B

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MAP/MAF – Throttle Position Correlation	P0068	Indicates that measured engine airflow does not match estimated engine airflow as established by the TP Sensor.	Absolute of (MAP based airflow – TP Sensor estimated airflow) AND Absolute of (MAF based airflow – TP Sensor estimated airflow) AND [(MAF failure or MAP failure) OR (NO Throttle DTC AND NO PCM-TACM serial data DTC)]	> 165 mg/cylinder  > 165 mg/cylinder	• Ignition on • Engine running = true.  • Engine Speed • No Throttle Actuation DTCs. • No PCM-TACM Serial Data DTC. • Both TPS Circuit DTCs are not set. • No PCM Processor DTCs • No TACM Processor DTC	> 2 seconds  > 600 RPM	Both fail counters are incremented by 2 for every error and decrement by 1 for every pass; both thresholds are 32; both fail counters must exceed threshold to set DTC.  Frequency: 18.75 ms loop Continuous	1 trip Type A
Mass Air Flow System Performance (naturally aspirated)	P0101	Determines if the MAF sensor is not within the normal operating range	ABS(Calculated Air Flow – Measured Air Flow) Filtered	> table lookup as a function of calculated flow	EGR Position EGR DC EVAP Purge Valve DC Delta MAP Delta TP Sensor Engine Vacuum TP Sensor  Ignition Voltage If ignition voltage Than undefaulted MAF must be	<=100% <=100% <=100% <=5.195313 kPa <=15% <=80 kpa <=100% >= 9 volts and <= 18 volts <= 11.5 Volts <= 40 gps	Continuous  Calculation are performed every 100 msec	2 trips Type B
					Enable Criteria Stable PCM State Traction Control No Active DTCs:	>= 2 seconds Run Not = Active • MAF_Sensor Group • MAP_Sensor Group • TP Sensor DTCs failing • EVAP DTCs failing • EGR_Control_Fault_Group • Throttle_Fault_Group • ECT_Sensor Group		

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						• IAT_Sensor Group		
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		<= 1200 Hertz (0.78 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Stab Time IAC TP Sensor	> 0 seconds ≥ 50 RPM ≥ 8 Volts ≥ 0.5 seconds ≥ 5 Steps ≥ 3.49%	395 failures out of 400 samples  100msec loop continuous	2 trips Type B
Mass Air Flow Sensor Circuit High Frequency	P0103	Detects a high frequency output from the MAF sensor	MAF Output	≥ 11500 Hertz (357.63 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Stab Time IAC TP Sensor	> 0 seconds ≥ 50 RPM ≥ 8 Volts ≥ 0.5 seconds ≥ 5 Steps ≥ 3.49%	395 failures out of 400 samples  100msec loop continuous	2 trips Type B
Manifold Absolute Pressure Sensor Performance (naturally aspirated)	P0106	Determines if the MAP sensor is stuck within the normal operating range	MAP (kPa) > or < predicted MAP (lookup tables as a function of TPS and RPM)	Lookup Tables See supporting tables Tab	Engine Speed  Engine Speed Engine Speed TP Sensor EGR IAC Brake Switch Chg Clutch Switch Power Steering AC Clutch State Traction Control Above Stable  No Active DTCs:	≥ 500 RPM  ≤ 5000 RPM Delta ≤ 125RPM Delta ≤ 100% Delta ≤ 20% Delta ≤ 10 Steps No Change No Change Stable No Change Not Active 1 Second  TP Sensor MAP_Sensor Group EGR_Control_Fault_Group Idle_Air_Fault_Group	20 failures out of 30 samples  Calculations are performed 1 Sample/Sec	2 trips Type B
Manifold Absolute Pressure Sensor Circuit Low (sensor without deadbands)	P0107	Detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP Voltage	< 1.73 % of 5 Volt Range (11 Kpa)	TP Sensor  TP Sensor  No Active DTCs:	≥ 0 & Engine Speed ≤ 1000 or ≥ 12% & Engine Speed > 1000 TP Sensor Idle_Air_Fault_Group	320 failures out of 400 samples 12.5 msec @ 0 RPM  Every Ref Pulse Below 1300 RPM Every other Ref Pulse above 1300RPM	2 trips Type B
Manifold Absolute Pressure Sensor Circuit High (sensor without deadbands)	P0108	Detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor.	MAP Voltage	> 96 % of 5 Volt Range (100 kPa)	TP Sensor  TP Sensor  Engine run time exceeds a threshold based on power-up ECT	< 1% & Engine Speed ≤ 1200 or < 20% & Engine Speed > 1200 See supporting tables tab	10 failures out of 50 samples	2 trips Type B

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					No Active DTCs:	Throttle_Fault_Group MAF_Sensor Group	1 sample every 12.5 msec	
Intake Air Temperature Sensor Circuit Low (High Temperature)	P0112	Detects a continuous short to ground in the IAT signal circuit or the IAT sensor	Raw IAT Input	IAT sensor signal < 0.703% (greater than 130C )	Engine Run Time Vehicle Speed Engine airflow ECT No Active DTCs:	> 10.0 seconds >= 25 MPH >= 10g/s <123 Deg C VehicleSpeedSensor Group ECT_Sensor Group	175 failures out of 1200 samples Continuous 100 msec	2 trips Type B
Intake Air Temperature Sensor Circuit High (Low Temperature)	P0113	Detects a continuous short to ground in the IAT signal circuit or the IAT sensor	Raw IAT Input	IAT sensor signal > 99% (less than -36 deg C )	Engine Run Time Vehicle Speed Engine airflow ECT No Active DTCs:	> 180 seconds >= 15 MPH >= 10g/s <123 Deg C VehicleSpeedSensor Group ECT_Sensor Group MAF_Sensor Group	1100 failures out of 1200 samples Continuous 100 msec	2 trips Type B
Engine Coolant Temperature (ECT) Sensor Performance	P0116	This DTC detects ECT temp sensor stuck in mid range.	A failure will be reported if any of the following occur:  1) ECT at power up > IAT at power up by an IAT based table lookup value after a minimum 480 minute soak (fast fail).  2) ECT at power up > IAT at power up by 15.7 C after a minimum 480 minute soak and a block heater has not been detected.  3) ECT at power up > IAT at power up by 15.7 C after a minimum 480 minute soak and the time spent cranking the engine without starting is greater than 5 seconds with the LowFuelConditionDiag	See "P0116: Fail if power up ECT exceeds IAT by these values" in the Supporting tables section	No Active DTC's  Non-volatile memory initialization  Test complete this trip  Test aborted this trip  IAT Low Fuel Condition Diag  <b>Diagnostic is aborted when Block Heater is detected. Block Heater is detected when the following occurs:</b>  1) ECT at power up > IAT at power up by 2) Cranking time 3) Power up IAT 4a) Vehicle drive time  4b) Vehicle speed 4c) IAT drops from power up IAT	VehicleSpeedSensor Group IAT_Sensor Group ECT_Sensor Group IgnitionOffTimeValid TimeSinceEngineRunningValid = Not occurred  = False  = False  ≥ -7 °C = False    > 15.7 °C < 5 Seconds > -7 °C > 300 Seconds  > 25 MPH ≥ 7 °C	1 failure  500 msec/sample  Once per valid cold start	2 trips Type B

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				= False				
Engine Coolant Temp Sensor Circuit Low	P0117	This DTC detects a short to ground in the ECT signal circuit or the ECT sensor.	ECT sensor signal is below a percentage of reference voltage	< 0.5078% (0.03 volts or greater than 139°C)	Engine run time  Or IAT min	> 3 seconds  ≤ 90 °C	240 failures out of 250 samples  1 sample every 100 msec Continuous	2 trips Type B
Engine Coolant Temp Sensor Circuit High	P0118	Circuit Continuity This DTC detects a short to high or open in the ECT signal circuit or the ECT sensor.	ECT sensor signal is above a percentage of reference voltage	< 99.4921% (4.97 volts or less than -37°C)	Engine run time  Or IAT min	> 30 seconds  ≥ 0 °C	240 failures out of 250 samples  1 sample every 100 msec Continuous	2 trips Type B
Throttle Position (TP) Sensor 1 Circuit	P0120	TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #1.  OR  TACM indicates an invalid minimum mechanical position for the TP sensor #1.  OR  TACM indicates reference voltage out of range.	1) Raw TP sensor signal  OR  2) TP sensor minimum mechanical stop voltage  OR	< 0.376 V or > 4.506 V   < 0.376 V or > 0.714 V.	• Ignition voltage • Valid TACM - PCM serial data. • No TACM processor DTC. • Ignition in Run or Crank.	> 5.23 V.	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.  3a). Continuous. Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms. For reference voltage direct short to ground.	1 trip Type A

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			3) Reference Voltage	< 4.54 V or > 5.21 V.			3b) 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 reference voltage to be 5volts +/- tolerance.	
Engine Coolant Temperature Below Stat Regulating Temperature	P0128	This DTC detects if the engine coolant temperature rises too slowly due to an ECT or Cooling system fault	Actual accumulated airflow is > predicted accumulated airflow before:  Range #1 (Primary) ECT reaches 80 °C when IAT min is ≤ 54.5°C and ≥ 10°C.  Range #2 (Alternate) ECT reaches 70 °C when IAT min is < 10°C and ≥ -7°C.	See "P0128: Maximum Accumulated Airflow for IAT and Start-up ECT conditions" in the Supporting tables section	No Active DTC's  Engine run time Fuel Condition <b>Range #1 (Primary) Test</b>  ECT at start run Average Airflow Vehicle speed  <b>Range #2 (Alternate) Test</b>  ECT at start run	MAP_Sensor Group MAF_Sensor Group Throttle_Fault_Group  IAT_Sensor Group ECT_Sensor Group  VehicleSpeedSensor Group 30 ≤ Eng Run Tme ≤ 1800 seconds Ethanol ≤ 100%  ≤ 75 °C ≥ 1 gps > 5 mph for at least 1.5 miles  ≤ 65 °C	30 failures to set DTC  1 sec/sample  Once per ignition cycle	2 trips Type B

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					Average Airflow Vehicle speed  <u>Accumulated Airflow Adjustments</u>  1) Max. airflow amount added when accumulating airflow is  2) Zero Airflow accumulated when airflow is  3) With Decel Fuel Cut Off active, accumulated airflow is reduced by multiplying actual airflow by	≥ 1 gps > 5 mph for at least 1.5 miles  30 gps  < 2 gps  1 times		
O2S Circuit Low Voltage Bank 1 Sensor 1	P0131	This DTC determines if the O2 sensor circuit is shorted to low.	Measure Oxygen Sensor Signal.	Oxygen Sensor signal is < 52.083 mvolts	No Active DTC's           POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test System Voltage  EGR Device Control  Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Equivalence Ratio	EOSD_System_Faults           = Not active = Not active = Not active = Not active = Not active = Not active 10 volts < system voltage < 18 volts = Not active  = Not active = Not active = Not active = False  0.88 <= equiv. ratio <= 1.088	380 failures out of 475 samples           x	2 trips Type B

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					Throttle Position  Fuel Control State <u>FUEL_Output_Control_Status</u> Num_Of_Cyls_Being_Fueled  Fuel Condition Fuel State <u>All of the above met for</u>  Time	2.5% <= Throttle <= 40 % = Closed Loop =Normal =6  > 3 seconds		
O2S Circuit High Voltage Bank 1 Sensor 1	P0132	This DTC determines if the O2 sensor circuit is shorted to high.	Measure Oxygen Sensor Signal.	Oxygen Sensor signal is > 1050.3 mvolts	No Active DTC's          POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test System Voltage  EGR Device Control   Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Equivalence Ratio  Throttle Position  Fuel Control State <u>FUEL_Output_Control_Status</u> Closed Loop Active All Fuel Injectors for active Cylinders Fuel State Fuel Condition <u>All of the above met for</u>  Time	EOSS_System_Faults          = Not active = Not active = Not active = Not active = Not active = Not active 10 volts < system voltage < 18 volts = Not active  = Not active = Not active = Not active = False  0.88 <= equiv. ratio <= 1.088 0 % <= Throttle <= 45 % = Closed Loop =Normal  > 3 seconds	100 failures out of 125 samples   Frequency: Continuous in 100 milli - second loop	2 trips Type B



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O2S Slow Response Bank 1 Sensor 1	P0133	This DTC determines if the O2 sensor response time is degraded.	The average response time is calculated over the test time, and compared to the threshold.	Lean to Rich Average Slope Time > 135 msec. OR Rich to Lean Average Slope Time > 145 msec.	No Active DTC's Bank 1 Sensor 1 DTC's not active Misfire Detected DTC not active  POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test  System Voltage EGR Device Control  Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Green O2S Condition  O2 Heater Temp Learned Htr resistance  Engine Coolant IAT Engine Run Time Time since any AFM status change Time since Purge On to Off change Time since Purge Off to On change Purge duty cycle Engine airflow  Engine speed  Fuel Baro	EOSD_System_Faults =P0030, P0053, P0131, P0132, P0134, =P0300  = Not active = Not active = Not active = Not active = Not active  10 volts < system voltage< 18 volts = Not active  = Not active = Not active = Not active = False  -1280 °C <Calculated O2 Temp <1280 °C = Valid  > 65 °C > -40 °C > 60 seconds  => 0 % duty cycle 15 gps <= engine airflow <= 29 gps 1300 <= RPM <= 3000	Sample time is 90 seconds  Frequency: Once per trip	2 trips Type B

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					Throttle Position Low Fuel Condition Diag  Fuel Control State Closed Loop Active LTM fuel cell Transient Fuel Mass  Baro <u>FUEL_Output_Control_Status</u> Fuel State Commanded Proportional Gain  <b>All of the above met for</b>  Time	>= 2 % = False  = Closed Loop = TRUE = Enabled  =Normal DFCO not active >=1.9999999553   > 0.8 seconds		
O2S Circuit Insufficient Activity Bank 1 Sensor 1	P0134	This DTC determines if the O2 sensor circuit is open.	Measure Oxygen Sensor Signal.	381.94 mvolts < Oxygen Sensor signal < 525.17 mvolts	No Active DTC's  System Voltage  AFM Status Heater Warm-up delay  Predicted Exhaust Temp (by location) Engine Run Time Fuel POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test	EOSD_System_Faults  10 volts < system voltage< 18 volts  = Wamed Up  > 124 seconds  = Not active = Not active = Not active = Not active = Not active	400 failures out of 500 samples.  Minimum of 0 delta TPS changes required to report fail. Delta TPS is incremented when the TPS % change >= 0 %  Frequency: Continuous 100msec loop	2 trips Type B
O2S Heater Performance Bank 1 Sensor 1	P0135	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	Measured Heater Current.	0.3125 amps < measured heater current < 1.425781 amps	No Active DTC's  System Voltage  Heater Warm-up delay  O2S Heater device control  B1S1 O2S Commanded Heater State <b>All of the above met for</b>  Time Engine Run Time	EOSD_System_Faults  10 volts < system voltage< 18 volts = Complete  = Not active  = ON  > 30 seconds >= 180 seconds	8 failures out of 10 samples  Frequency: 2 tests per trip  2 seconds delay between tests and 1 second execution rate	2 trips Type B

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O2S Circuit Low Voltage Bank 1 Sensor 2	P0137	This DTC determines if the O2 sensor circuit is shorted to low.	Measure Oxygen Sensor Signal.	Oxygen Sensor signal is < 52.083 mvolts	No Active DTC's  POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test System Voltage  EGR Device Control  Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Equivalence Ratio Throttle Position Fuel Control State <u>FUEL Output Control Status</u> Closed Loop Active All Fuel Injectors for active Cylinders Fuel State Fuel Condition <b>All of the above met for</b>  Time	EOSD_System_Faults    = Not active = Not active = Not active = Not active = Not active 10 volts < system voltage < 18 volts = Not active  = Not active = Not active = Not active = False  10 volts < system voltage < 18 volts = Closed Loop = Normal  > 3 seconds	430 failures out of 540 samples  Frequency: Continuous in 100 milli - second loop	2 trips Type B
O2S Circuit High Voltage Bank 1 Sensor 2	P0138	This DTC determines if the O2 sensor circuit is shorted to high.	Measure Oxygen Sensor Signal.	Oxygen Sensor signal is > 1050.3 mvolts	No Active DTC's  POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test	EOSD_System_Faults    = Not active = Not active = Not active = Not active	100 failures out of 125 samples  Frequency: Continuous in 100 milli - second loop	2 trips Type B

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					EGR intrusive test System Voltage  EGR Device Control  Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Equivalence Ratio Throttle Position  Fuel Control State <u>FUEL_Output_Control_Status</u> Closed Loop Active All Fuel Injectors for active Cylinders Fuel State Fuel Condition <b>All of the above met for</b>  Time	= Not active 10 volts < system voltage< 18 volts = Not active  = Not active = Not active = Not active = False  0 0 % <= Throttle <= 45 % = Closed Loop =Normal          > 3 seconds		
O2S Circuit Insufficient Activity Bank 1 Sensor 2	P0140	This DTC determines if the O2 sensor circuit is open.	Measure Oxygen Sensor Signal.	381.94 mvolts < Oxygen Sensor signal < 525.17 mvolts	No Active DTC's  System Voltage  AFM Status Heater Warm-up delay  Predicted Exhaust Temp (by location) Engine Run Time Fuel POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test	EOSD_System_Faults  10 volts < system voltage< 18 volts  = Wamed Up  > 124 seconds  = Not active = Not active = Not active = Not active = Not active	590 failures out of 740 samples.  Minimum of 3 delta TPS changes required to report fail. Delta TPS is incremented when the TPS % change >= 5.195313 %  Frequency: Once per trip for post sensors  100msec loop	2 trips Type B
O2S Heater Performance Bank 1 Sensor 2	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	Measured Heater Current.	0.2148438 amps < measured heater current < 0.9570313 amps	No Active DTC's  System Voltage  Heater Warm-up delay	EOSD_System_Faults  10 volts < system voltage< 18 volts = Complete	8 failures out of 10 samples  Frequency: 2 tests per trip	2 trips Type B

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					O2S Heater device control B1S1 O2S Commanded Heater State <b>All of the above met for</b> Time Engine Run Time	= Not active = ON  > 30 seconds >= 180 seconds	2 seconds delay between tests and 1 second execution rate	
Fuel System Too Lean Bank 1	P0171	Determines if the fuel control system is in a lean condition, based on the filtered combined fuel trim correction of the long-term fuel trim and the short-term fuel trim.	The filtered combined fuel trim metric.  Before a pass or fail decision can be made.  Greater than 24 seconds of data must accumulate on each trip, with at least 15 seconds of data in the current fuel trim cell and at least 2.0 seconds since the last fuel trim cell change	> 1.22	Engine speed BARO Coolant Temp MAP Inlet Air Temp MAF VSS Fuel Level  Long Fuel Trim data accumulation:  <b>Closed loop fueling Enabled</b> Long Fuel Trim enabled  Engine speed  Fuel Level  EGR Flow Diag. Intrusive Test Active Catalyst Monitor Diag. Intrusive Test Active Post O2 Diag. Intrusive Test Active Device Control Active EVAP Diag. "tank pull down" portion of the test Active fuel trim metric updated during decels? <b>NO</b> No active DTCs:	500 <rpm< 6000 > 70 kPa -39 <°C< 132 5 <kPa< 105 -20.5 <°C< 150 0.5 <g/s< 510 < 82 mph > 10 % or if fuel sender is faulty > 24 seconds of data must accumulate on each trip, with at least 15 seconds of data in the current fuel trim cell before a pass or fail decision can be made.  Closed Loop Enabled and coolant temp > 10 and < 139  rpm< 500 or rpm> 6000  < 10 % for at least 10 seconds  Idle_Air_Fault_Group MAP_Sensor_Fault_Group Air_Flow_Fault_Group  AIR_Fault_Group Purge_Control_Fault_Group Oxygen Sensor Fault Group	> 100 ms Frequency: Continuous  Development data indicates that the Fuel Adjustment System Diagnostic (FASD) is typically enabled during 54 % of the EPAIII drive cycle. This is also typical of real-world driving, however values will vary (higher or lower) based on the actual conditions present during the drive cycle.	2 trips Type B

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						Fuel_Injector_Fault_Group Misfire_Fault_Group EGR_Control_Fault_Group EGR_Sensor_Fault_Group		
Fuel System Too Rich Bank 1	P0172	<p>Determines if the fuel control system is in a rich condition, based on the filtered combined fuel trim correction of the long-term fuel trim and the short-term fuel trim.</p> <p>There are two different, yet related tests that are used to determine a Rich fault, they are Passive and Intrusive and are described below:</p> <p>Passive Test: Non-purge cells are monitored to determine if a rich condition exists.</p> <p>Intrusive Test- When the filtered Combined Purge-On Fuel Trim metric is <math>\leq 0.81</math>, Purge is ramped off to determine if excess purge vapor is the cause of the Rich condition. If the filtered Combined Purge-on Fuel Trim metric <math>&gt; 0.81</math> the test</p>	<p>Before a Passive or an Intrusive test pass or fail decision can be made.</p> <p>Greater than 24 seconds of data must accumulate on each trip, with at least 15 seconds of data in the current fuel trim cell and at least 2 seconds since the last fuel trim cell change</p> <p>The filtered Combined Non-Purge Fuel Trim metric <math>\leq 0.805</math></p> <p>If the Combined Purge-On Fuel Trim metric <math>\leq 0.81</math></p> <p>AND The filtered Combined Non-Purge Fuel Trim metric <math>\leq 0.805</math></p>		<p>BARO Coolant Temp MAP IAT MAF VSS Fuel Level</p> <p>Long Fuel Trim data accumulation:</p> <p><b>Closed loop fueling Enabled</b> Long Fuel Trim enabled</p>	<p><math>&gt; 70</math> kPa <math>-39 &lt;^{\circ}\text{C} &lt; 132</math> <math>5 &lt; \text{kPa} &lt; 105</math> <math>-20.5 &lt;^{\circ}\text{C} &lt; 150</math> <math>0.5 &lt; \text{g/s} &lt; 510</math> <math>&lt; 82</math> mph <math>&lt; 10</math> % for at least 10 seconds <math>&gt; 24</math> seconds of data must accumulate on each trip, with at least 15 seconds of data in the current fuel trim cell before a pass or fail decision can be made.</p> <p>Closed Loop Enabled and coolant temp <math>&gt; 10</math> and <math>&lt; 139</math></p>	<p><math>&gt; 100</math> ms Frequency: Continuous</p> <p>Fail determinations require that the Malfunction Criteria be satisfied for 3 out of 5 intrusive segments.</p>	2 trips Type B

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		<p>passes without checking the Combined Non-Purge Fuel Trim metric.</p>	<p>Segment Definition - Segments can last up to 60 seconds, and are separated by the lesser of XX seconds of purge-on time or enough time to purge X grams of vapor.</p> <p>A maximum of X completed segments or XX intrusive attempts are allowed for each intrusive test.</p> <p>After an intrusive test report is completed, another intrusive test cannot occur for XXX seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the filtered Purge-on Long Term fuel trim &gt; Purge Rich Limit Table for at least XXX seconds, indicating that the canister has been purged.</p> <p>Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics.</p>	<p><b>disable</b></p> <p><b>conditions:</b></p>	<p>Engine speed</p> <p>EGR Flow Diag. Intrusive Test Not Active</p> <p>Fuel Level</p> <p>Catalyst Monitor Diag. Intrusive Test Not Active</p> <p>Post O2 Diag. Intrusive Test Not Active</p> <p>Device Control Not Active</p> <p>EVAP Diag. "tank pull down" portion of the test Not Active</p> <p>fuel trim metric updated during decels? <b>NO</b></p> <p>No active DTCs:</p>	<p>rpm &lt; 500 or rpm &gt; 6000</p> <p>&lt; 10 % for at least 10 seconds</p> <p>Idle_Air_Fault_Group</p> <p>MAP_Sensor_Fault_Group</p> <p>Air_Flow_Fault_Group</p> <p>AIR_Fault_Group</p> <p>Purge_Control_Fault_Group</p> <p>Oxygen Sensor Fault Group</p> <p>Fuel_Injector_Fault_Group</p> <p>Misfire_Fault_Group</p> <p>EGR_Control_Fault_Group</p> <p>EGR_Sensor_Fault_Group</p>	<p>Development data indicates that the Fuel Adjustment System Diagnostic (FASD) is typically enabled during 54 % of the EPAIII drive cycle. This is also typical of real-world driving, however values will vary (higher or lower) based on the actual conditions present during the drive cycle.</p>	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Injector 1	P0201	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match		Ignition switch in Run or Crank	9 volts ≤ Voltage ≤ 18 volts Injector on > 0.5 seconds	50 failures out of 63 samples 100 ms /sample Continuous	2 trips Type B
Injector 2	P0202	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match		Ignition switch in Run or Crank	9 volts ≤ Voltage ≤ 18 volts Injector on > 0.5 seconds	50 failures out of 63 samples 100 ms /sample Continuous	2 trips Type B
Injector 3	P0203	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match		Ignition switch in Run or Crank	9 volts ≤ Voltage ≤ 18 volts Injector on > 0.5 seconds	50 failures out of 63 samples 100 ms /sample Continuous	2 trips Type B
Injector 4	P0204	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match		Ignition switch in Run or Crank	9 volts ≤ Voltage ≤ 18 volts Injector on > 0.5 seconds	50 failures out of 63 samples 100 ms /sample Continuous	2 trips Type B
Injector 5	P0205	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match		Ignition switch in Run or Crank	9 volts ≤ Voltage ≤ 18 volts Injector on > 0.5 seconds	50 failures out of 63 samples 100 ms /sample Continuous	2 trips Type B
Injector 6	P0206	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match		Ignition switch in Run or Crank	9 volts ≤ Voltage ≤ 18 volts Injector on > 0.5 seconds	50 failures out of 63 samples 100 ms /sample Continuous	2 trips Type B
Throttle Position (TP) Sensor 2 Circuit	P0220	TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #2.  OR  TACM indicates an invalid minimum mechanical position for the TP sensor #2.  OR  TACM indicates reference voltage out of range.	Raw TP sensor signal  OR	< 0.282 V or > 4.60 V	• Ignition voltage • Ignition in Run or Crank. • Valid TACM - PCM serial data. • No TACM processor DTC.	> 5.23 V	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.	1 trip Type A
			TP sensor minimum mechanical stop voltage OR	< 0.282 V or > 0.813V				



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel Pump Primary Circuit (ODM)	P0230	This DTC checks the circuit for electrical integrity during operation.	Reference voltage	> 4.54 V or < 5.21 V			3) Continuous. Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms. For Reference voltage direct short to ground.	No MIL Type C
			The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage	9 volts ≤ Voltage ≤ 18 volts	0.5 s	
							100 ms /sample Continuous	
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	P0300 P0301 P0302 P0303 P0304 P0305 P0306	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  Catalyst Damage Threshold          Misfire Percent Catalyst Damage	1%      5 – 31.875% depending on engine speed and engine load          >"Catalyst Damaging Misfire Percentage" Table	Engine Run Time  ECT  If ECT at startup ECT  System Voltage + Throttle delta - Throttle delta	> 2 crankshaft revolutions -7°C < ECT < 130°C < -7°C -21°C < ECT < 130°C 9.00<volts<18.00 < 100% per 25 ms < 100% per 25 ms	Emission Exceedence = 5 failed 200 rev blocks of 16. Failure reported with 1 Exceedence in 1st (16) 200 rev block, or 4 Exceedences thereafter.  1st Catalyst Exceedence = (1) 200 rev block as data supports for catalyst damage. 2nd and 3rd Catalyst Exceedence = (1) 200 rev block with catalyst damage. Failure reported with (1) Exceedences in FTP, or (1) Exceedence Continuous	2 Trips  Type B  (Mil Flashes with Catalyst Damaging Misfire)

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine Speed	475 < rpm < 5600		
						Engine speed limit is a function of inputs like Gear and temperature		
						typical Engine Speed Limit = 6000 rpm		
				disable conditions:	No active DTCs:	Throttle_Fault_Group	4 cycle delay	
						MAF_Sensor Group		
						IAT_Sensor Group ECT_Sensor Group 5VoltReferenceB_FA		
						CrankSensorTestFailed TKO CrankSensorFaultActive CrankIntakeCamCorrelationFA CrankExhaustCamCorrelationFA CrankCamCorrelationFTKO		
					P0315 & engine speed Fuel Level Low	> 1000 rpm LowFuelConditionDiagnostic	500 cycle delay	
					Cam and Crank Sensors	in sync with each other	4 cycle delay	
					Misfire requests TCC unlock	Not honored because Transmission in hot mode	4 cycle delay	
					Fuel System Status Active Fuel Management	≠ Fuel Cut Transition in progress	4 cycle delay 7 cycle delay	
					Undetectable engine speed and engine load region	invalid speed load range in <b>decel index</b> tables	4 cycle delay	
					Below zero torque (except CARB approved 3000 rpm to redline triangle.)	<" Zero torque engine load" in Supporting Tables tab	4 cycle delay	



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Crankshaft Position System Variation Not Learned	P0315	Monitor for valid crankshaft error compensation factors	Sum of Compensation factors	≥ 3.0043 OR ≤ 2.9970	OBD Manufacturer Enable Counter		0.50 seconds  Frequency Continuous 100 msec	1 trip Type A
Knock Sensor (KS) Circuit Bank 1	P0325	This diagnostic checks for an open in the knock sensor circuit	Gated Low Pass Filter Voltage Instantaneous Voltage: delta from	≥ 4.8 Volts or delta ≤ 0.03125 Volts	Diagnostic Enabled (1 = Enabled)  Engine Speed  ECT Enginer Run Time Ignition Voltage Throttle Position Engine Load Spark Retard No Active DTC's	= 1  RPM between 1000 and 2500 rpm ≥ 60 deg. C ≥ 30 seconds ≥ 9 volts ≥ 10.00% ≥ 40.00% ≤ 15.01 degrees VehicleSpeedSensor Group Throttle_Fault_Group ECT_Sensor Group Crank_Sensor_Fault_Group CAM_Sensor_Fault_Group MAF_Sensor Group	260 Failures out of 300 Samples  100 msec rate	2 trips Type B
Knock Sensor (KS) Circuit Low Bank 1	P0327	This diagnostic checks for an out of range low knock sensor signal	Instantaneous Voltage: delta from average ≤ 0.03125V	< 4.8 Volts or delta ≤ 0.03125 Volts	ECT Enginer Run Time Engine Speed  Ignition Voltage Throttle Position Engine Load Spark Retard	≥ 60 deg. C ≥ 30 seconds RPM between 1000 and 2500 rpm ≥ 9 volts ≥ 10.00% ≥ 40.00% ≤ 15.01 degrees	260 Failures out of 300 Samples	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					No Active DTC's	EngOilModeledTempValid VehicleSpeedSensor Group Throttle_Fault_Group ECT_Sensor Group Crank_Sensor_Fault_Group CAM_Sensor_Fault_Group MAF_Sensor Group	100 msec rate	
Knock Sensor (KS) Circuit Low Bank 2	P0332	This diagnostic checks for an out of range low knock sensor signal	Instantaneous Voltage: delta from average $\leq 0.03125V$  or	> 2.86 Volts	ECT Enginer Run Time Engine Speed  Ignition Voltage Throttle Position Engine Load Spark Retard  No Active DTC's	$\geq 60$ deg. C $\geq 30$ seconds RPM between 1000 and 2500 rpm $\geq 9$ volts $\geq 10.00\%$ $\geq 40.00\%$ $\leq 15.01$ degrees  EngOilModeledTempValid VehicleSpeedSensor Group Throttle_Fault_Group ECT_Sensor Group Crank_Sensor_Fault_Group CAM_Sensor_Fault_Group MAF_Sensor Group	260 Failures out of 300 Samples  100 msec rate	2 trips Type B
Crankshaft Position (CKP) Sensor A Circuit	P0335	This diagnostic determines whether a circuit fault exists with	If 6 low res pulses have been seen and 0 med res pulses have		• Engine run time	> 3 seconds	Low res interrupt - for low res check	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		the low res sensor signal	been seen  AND  1 cam has been seen and 0 med res pulses have been seen		• Engine Speed • Cam pulse seen or 6 low res pulses seen	> 100	100 ms - for cam check  40 failures out of 50 samples	
Crankshaft Position (CKP) Sensor A Performance	P0336	This diagnostic determines whether a performance fault exists with the low res sensor signal	If 6 low res pulses have been seen and a number of med res pulses other than 0 or 36 have been seen  AND  1 cam has been seen and a number of med res pulses other than 0 or 36 have been seen		• Engine run time  • Engine Speed • Cam pulse seen or 6 low res pulses seen	> 3 seconds  > 100	Low res interrupt - for low res check  100 ms - for cam check  40 failures out of 50 samples	2 trips Type B
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A	P0340	Determines if a fault exists with the cam position bank 1 sensor A signal	If 36 med res pulses have been seen and 0 cam pulses have been seen  AND  6 low res pulses have been seen and 0 cam pulses have been seen		• Engine run time  • Engine Speed • Cam pulse seen or 6 low res pulses seen	> 3 seconds  > 100	Med res interrupt - for med res check Low res interrupt - for low res check  40 failures out of 50 samples	2 trips Type B
Camshaft Position (CMP) Sensor Performance Bank 1 Sensor A	P0341	Determines if a performance fault exists with the cam position bank 1 sensor A signal	If 36 med res pulses have been seen and 2 or more cam pulses have been seen  AND  6 low res pulses have been seen and 2 or more cam pulses have been seen		• Engine run time  • Engine Speed • Cam pulse seen or 6 low res pulses seen	> 3 seconds  > 100	Med res interrupt - for med res check Low res interrupt - for low res check  40 failures out of 50 samples	2 trips Type B
IGNITION CONTROL CIRCUIT	P0350	This diagnostic checks the circuit for electrical integrity during operation. Monitors EST for Cylinder 1 (Cylinders 1 and 4 for V6 with waste spark)	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Fault is detected	Engine running or cranking No P1350 DTC Active		90 Failures out of 100 Samples  100 msec rate	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Crankshaft Position (CKP) Sensor B Circuit	P0385	This diagnostic determines whether a circuit fault exists with the low res sensor signal	If 36 med res pulses have been seen and 0 low res pulses have been seen  AND  1 cam pulse has been seen and 0 low res pulses have been seen		<ul style="list-style-type: none"> <li>• Engine run time</li> <li>• Engine Speed</li> <li>• Cam pulse seen or 6 low res pulses seen</li> </ul>	<p>&gt; 3 seconds</p> <p>&gt; 100</p>	<p>Med res interrupt - for med res check 100 ms - for cam check</p> <p>40 failures out of 50 samples</p>	2 trips Type B
Crankshaft Position (CKP) Sensor B Performance	P0386	This diagnostic determines whether a performance fault exists with the low res sensor signal	If 36 med res pulses have been seen and a number of low res pulses other than 0 or 6 have been seen  AND  1 cam pulse has been seen and a number of low res pulses other than 0 or 6 have been seen		<ul style="list-style-type: none"> <li>• Engine run time</li> <li>• Engine Speed</li> <li>• Cam pulse seen or 6 low res pulses seen</li> </ul>	<p>&gt; 3 seconds</p> <p>&gt; 100</p>	<p>Med res interrupt - for med res check 100 ms - for cam check</p> <p>40 failures out of 50 samples</p>	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Exhaust Gas Recirculation (EGR) Flow Insufficient (Quick Test)	P0401	During a closed throttle decel condition, the EGR valve is normally closed. This diagnostic opens the valve to a pre-determined position, and the change in MAP is computed. This change in MAP correlates to the flow rate of the EGR system.	With EGR valve open, the peak + MAP □ is monitored over a period of time. This value is compared with a threshold from Engine Speed vs. BARO table and the difference computed. The result is statistically filtered (EWMA) and compared to a decision limit. DTC is set when the filtered result exceeds the decision limit of	< 0.6543 kPa.	Test Enables No Fuel_Injector_Fault_Group DTCs set, No Crank_Sensor_Fault_Group DTCs set, No MAP_Sensor Group DTCs set, No VehicleSpeedSensor Group DTCs set, No Throttle_Fault_Group DTCs set, No 5 volt reference DTCs set, No IAT_Sensor Group sensor DTCs set, No ECT_Sensor Group DTCs set, No Idle_Air_Fault_Group DTCs set, No EGR Pintle Position DTC set, No Misfire DTCs set, No MAF_Sensor Group DTCs set, No CPP (Clutch) DTCs set, Not in device control, EGR valve icing not occurring, EGR Engine run time expired, Not in Power Enrichment		Test Time 800 ms  Frequency 6.26 ms loop  Once per trip (typically)  Rapid Step Response feature will initiate multiple tests: IF  the difference between the current EWMA and the current map difference is > 1.25 to 1.87 kPa (depends on Baro)  AND	1 trip Type A
					ECT BARO IAT Ignition Voltage Transmission Gear Decel Fuel Cutoff is either inactive (mode 0) or at a commanded spark value of 0 (mode 2)  Vehicle speed Throttle Position Transmission status is unchanged  Throttle Area Delta Stability Mode Enables EGR Position Engine Speed MAP delta	> 75 deg. C and < 151.953 deg. C > 74 kPa (8,000 ft) > -7C IAT and <100C IAT > 11 volts and < 18 volts 3rd gear or 4th gear ≥ 6.25 ms  > 28 MPH and < 70 MPH < 0.9% > 1.5 seconds.  < 100 %  < 1% > 1000 RPM and < 1500 RPM < 1.201 kPa	current map difference is > - 0.15 to 1.03 kPa (depends on Baro)  THEN 4 to 6 tests (depends on Baro) may be run per trip until 21 to 33 tests (depends on Baro) have been completed  Fast Initial Response feature will initiate multiple tests upon code clear or a non-volatile memory failure: Several tests per	



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Compensated MAP Throttle Area Delta Difference between desired & actual airflow Intrusive Mode Enables Vehicle Speed delta positive RPM delta negative RPM delta Max EGR Position EGR Duty Cycle On Time Throttle Area Delta	> 17 kPa and < 43 kPa < 100% < 1.2 Grams/sec.  < 3 MPH < 100 RPM < 200 RPM > 75% and < 95% < 25 seconds < 100%	trip will run until 15 to 20 tests (depends on Baro) have been completed.	
Exhaust Gas Recirculation (EGR) Solenoid Control Circuit	P0403	This DTC checks the Linear EGR circuit for electrical integrity	Output state invalid		<ul style="list-style-type: none"> <li>Ignition switch is in crank or run</li> <li>Ignition Voltage</li> </ul>	> 9 volts and < 18 volts	20.00 seconds  OR  chip protection logic indicates a short failure 1 time  Frequency: Continuous 100 ms loop  Chip protection logic: 5 failures out of 10 samples indicate a short  Frequency of this logic is 12.5 ms loop Continuous  Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	2 trips type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Exhaust Gas Recirculation (EGR) Open Position Performance	P0404	This diagnostic detects if the pintle position error is too large	Pintle position error [absolute value of (desired position - actual position)]	> 20.00 %	5 Volt reference DTCs not active Engine Overtemp DTCs not active Engine is running Off-board device not active Pintle cleaning not active P0401 not intrusive Ignition voltage  Desired EGR position  delta Desired EGR position Enable Stability Limit Time	> 11 volts          > 0% < 19.5 % for 1 sec. > 0.2 sec.	Frequency: 232 fail counts out of 400 sample counts  100ms loop Continuous	2 trips type B
Exhaust Gas Recirculation (EGR) Position Sensor A Circuit Low Voltage	P0405	This diagnostic detects if the pintle position feedback circuit is open or shorted to ground	EGR feedback sensor signal	< 4.0% (0.25 Volts)	5 Volt reference DTCs not active Engine is running Off-board device not active Pintle cleaning not active P0401 not intrusive Ignition voltage  Enable Stability Limit Time	> 11 volts          > 0.2 sec.	Frequency: 50 fail counts out of 55 sample counts  100ms loop Continuous	2 trips type B
Exhaust Gas Recirculation (EGR) Position Sensor A Circuit High Voltage	P0406	This diagnostic detects if the pintle position feedback circuit is shorted to high voltage or the 5V return is open	EGR feedback sensor signal	> 94.7% (4.735 Volts)	5 Volt reference DTCs not active Engine is running Off-board device not active Pintle cleaning not active P0401 not intrusive Ignition voltage  Enable Stability Limit Time	> 11 volts          > 0.2 sec.	180 fail counts out of 200 sample counts  100ms loop Continuous	2 trips type B
Secondary AIR Incorrect Airflow Single Bank Systems	P0411	<p>Detects an insufficient flow condition</p> <p>This test is run during Phase 1 (AIR pump commanded On, Valve commanded Open)</p> <p>Leaks downstream of the valve are detected via an evaluation of both pressure error and average pressure "String Length"(SL) – a term that represents the absolute pressure delta accumulated every 6.25ms, then averaged over the duration of the test. Low SL values are indicative of downstream</p>	<p>Predicted System Pressure versus Actual System Pressure Error or OR System Pressure Error  or while the Average String Length</p>	<p>&gt; 3.5 kPa &lt; -4.2 kPa</p> <p>&gt; 1 kPa</p> <p>&lt; -1 kPa &lt;SL Threshold Bank 1 Table</p> <p>disable</p>	<p>BARO Inlet Air Temp Coolant Temp  System Voltage SL Stability time SL Range  Conditional test weight is calculated by <u>multiplying the following Factors</u> Phase 1 Baro Test Weight Factor = .035 Phase 1 MAF Test Weight Factor = .148 Phase 1 System Volt Test Weight Factor = .859 Phase 1 Ambient Temp Test Weight Factor = 0</p>	<p>&gt; 60 kPa &gt; 4.4 deg C. &gt; 4.4 deg C. &lt; 50 deg C.  &gt; 9 &gt; 5 seconds rpm &lt; 3000 and &gt; 3400</p>	<p>Phase 1 Conditional test weight &gt; 7 seconds  Total 'String Length' accumulation time  &gt; 10 seconds</p>	2 trips type B (L26 PZEV only)

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		are indicative of downstream leaks or blockages.		conditions:	MAF No active DTCs:	> 75 gm/s AIRSystemPressureSensor FA AIRValveControlCircuit FA AIRPumpControlCircuit FA MAF_Sensor Group MAP_Sensor Group IAT_Sensor Group ECT_Sensor Group P0300 P0420  ControllerProcessorPerf FA P0641 P0651 EST_Fault_Group Fuel_Injector_Fault_Group	Frequency: Once per trip when AIR pump commanded On	
Secondary AIR Solenoid Control Circuit	P0412	This DTC checks the AIR solenoid circuit for electrical integrity	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		System Voltage	> 9 Volts < 18 Volts  Ignition Switch is in Crank or Run	15 failures out of 20 samples OR Chip protection logic indicates a short failure 1 time	2 trips type B (L26 PZEV only)
Secondary AIR Pump Control Circuit	P0418	This DTC checks the AIR Pump circuit for electrical integrity	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		System Voltage	> 9 Volts < 18 Volts  Ignition Switch is in Crank or Run	15 failures out of 20 samples OR Chip protection logic indicates a short failure 1 time	2 trips type B (L26 PZEV only)
Catalyst System Low Efficiency Bank 1	P0420	Oxygen Storage	OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 response time - pre cat O2 response time)		<u>Valid Idle Period Criteria</u>		1 test attempted per valid idle period  Minimum of 1 test per trip	Type A 1 Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		<p>The catalyst washcoat contains Cerium Oxide. Cerium Oxide reacts with NO and O2 during lean A/F excursions to store the excess oxygen (I.e. Cerium Oxidation). During rich A/F excursions, Cerium Oxide reacts with CO and H2 to release this stored oxygen (I.e. Cerium Reduction). This is referred to as the Oxygen Storage Capacity, or OSC. CatMon's strategy is to "measure" the OSC of the catalyst through forced Lean and Rich A/F excursions</p> <p>The Catalyst Monitoring Test is done during idle. Several conditions must be met in order to execute this test. These conditions and their related values are listed in the secondary parameters area of this document.</p>	<p>OSC time difference</p> <p>(EWMA filtered)</p> <p>OSC worst pass thresh</p>	<p>≥0.1015625</p> <p>2.4875 seconds</p>	<p>Throttle Position</p> <p>Vehicle Speed</p> <p>Engine speed</p> <p>Engine run time</p> <p>Tests attempted this trip</p> <p>Engine speed</p> <p>Intrusive test(s):</p> <p>Fueltrim</p> <p>Post O2</p> <p>EVAP</p> <p>EGR</p> <p><b>Catalyst Idle Conditions Met Criteria</b></p> <p>General Enable met and the</p> <p>Green Converter Delay</p> <p>Induction Air</p> <p>System Voltage</p> <p>Δ Short term Fuel Trim</p> <p>ECT</p> <p>Barometric Pressure</p> <p>Idle Time</p>	<p>&lt; 1.503906 %</p> <p>&lt; 3.2 Kph</p> <p>&gt; 1100 RPM for a minimum of 30 seconds since end of last idle period.</p> <p>≥ 350 seconds</p> <p>≤ 6</p> <p>&lt; 1100 RPM</p> <p>Not Active</p> <p>Not Active</p> <p>-20 &lt; ° C &lt; 100</p> <p>&gt; 10.70 Volts</p> <p>≤2 since valid idle conditions met</p> <p>70 &lt; ° C &lt; 126</p> <p>&gt; 70 KPA</p> <p>0 ≤ seconds ≤ 120</p>	<p>Maximum of 6 tests per trip</p> <p>Frequency: Fueling Related : 12.5 ms</p> <p>OSC Measurements: 100 ms</p> <p>Temp Prediction: 1000ms</p>	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Idle time is incremented if Vehicle speed  Short Term Fuel Trim Predicted catalyst temp  Closed loop fueling Long Term Fuel Trim Learning PRNDL  is in Drive Range on an Auto Transmission vehicle.  <b>Idle Stable Criteria :: Must hold true from 5 seconds</b> Delta IAC Delta RPM MAF CCP Multiplier Desired RPM Gain Desried RPM Tests attempted this idle period  Load Change  <b>Engine Fueling Criteria at Beginning of Idle Period</b> The following fueling related must also be met from Number of pre-O2 switches Short Term Fuel Trim Avg	$< 3.2$ Kph and the throttle position $< 1.50.906$ % as identified in the Valid Idle Period Criteria section $0 < ST FT < 2$ $530^{\circ}\text{C} \leq$ predicted catalyst temperature $\leq 830^{\circ}\text{C}$ for at least 30 seconds with a closed throttle time $\leq 120$ seconds consecutively (closed throttle = TPS $< 1.5303906\%$ )  Enabled Enabled =Drive Range  $\leq 255$ steps $\leq 12800$ $3.00 < g/s < 12.00$ $\leq 1$ $\leq 12800$ $\leq 12800$ $< 1$  If during test enable conditions, the engine load changes more than 100%, the test starts over. If during the intrusive portion of the test, the load changes by more than 100%, then the test is aborted for that idle.  $\geq 4$ $0.940 < ST FT Avg < 1.060$		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					<p>Average BPW</p> <p>After engine fueling criteria has been met: <math>94.7 \leq</math> short <b>Rapid Step Response (RSR) feature will initiate</b>                      If the difference between current EWMA value and the Maximum of 6 tests per trip. Maximum of 18 tests tp detect <b>Green Converter Delay Criteria</b>                      This is part of the check for the Catalyst Idle Conditions                      The diagnostic will not be enabled until the following has Predicted catalyst temperature <math>&gt; 525^{\circ} \text{C}</math> for 3600</p> <p><b>General Enable</b>  <b>DTC's Not Set</b>                      MAF_Sensor Group                      Throttle_Fault_Group                      IAT_Sensor Group                      ECT_Sensor Group                      Oxygen_Sensor_Fault_Group                      EVAP_Fault_Group                      BARO_Sensor Group                      AIR_System Group                      Fuel_Trim_Fault_Group                      EST_Fault_Group                      Misfire_Fault_Group                      Idle_Air_Fault_Group                      EGR_Control_Fault_Group                      CAM_Sensor_Fault_Group                      Crank_Sensor_Fault_Group                      Throttle_Fault_Group                      Fuel_Injector_Fault_Group                      MAP_Sensor Group                      Engine_Overtemp_Fault_Group                      VehicleSpeedSensor Group</p>	<p>within a window based on a table defined by airflow (see table)</p>		
Exhaust Gas Recirculation (EGR) Closed Position Performance	P042E	This diagnostic detects if the valve is stuck open when commanded closed.	Actual pintle position	$\geq 5.5\%$ away from learned closed position	<p>5 Volt reference DTCs not active                      EGR Position Sensor A Circuit High Voltage (P0406) not failing                      Engine is running                      Off-board device not active                      Pintle cleaning not active                      P0401 not intrusive                      Ignition voltage</p> <p>Desired EGR position</p>	<p><math>&gt; 11</math> volts</p> <p>0% for 1 sec.</p>	<p>4 failure detections of:                      360 fail counts out of 400 sample counts                      (with pintle movement between failure detections of 40% for at least 1 second open time)</p>	2 trips type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Enable Stability Limit Time	> 0.2 sec.	Frequency: 100ms loop Continuous	
Evaporative Emission (EVAP) System Small Leak Detected	P0442	<p>This DTC will detect a small leak (<math>\geq 0.020''</math>) in the EVAP system between the fuel fill cap and the purge solenoid. The engine off natural vacuum method (EONV) is used. EONV is an evaporative system leak detection diagnostic that runs when the vehicle is shut off when enable conditions are met. Prior to sealing the system and performing the diagnostic, the fuel volatility is analyzed. In an open system (Canister Vent Solenoid [CVS] open) high volatility fuel creates enough flow to generate a measurable pressure differential relative to atmospheric.</p> <p>After the volatility check, the vent solenoid will close. After the vent is closed, typically a build up of pressure from the hot soak begins (phase-1). The pressure typically will peak and then begin to decrease as the fuel cools. When the pressure drops (-62.27 Pa from peak pressure, the vent is then opened for 60 seconds to normalize the system pressure. The vent is again closed to begin the vacuum portion of the test (phase-2). As the fuel temperature continues to fall, a vacuum will begin forming. The vacuum will continue until it reaches a vacuum peak. When the pressure rises 62.27 Pa from vacuum peak, the test then</p>	<p>The total delta from peak pressure to peak vacuum during the test is normalized against a calibration pressure threshold table that is based upon fuel level and ambient temperature. (See P0442: EONV Pressure Threshold Table on Supporting Tables Tab). The normalized value is calculated by the following equation: <math>1 - (\text{peak pressure} - \text{peak vacuum}) / \text{pressure threshold}</math>. The normalized value is entered into EWMA (with 0= perfect pass and 1= perfect fail).</p> <p>When EWMA is</p> <p>, the DTC light is illuminated. The DTC light can be turned off if the EWMA is</p> <p>and stays below the EWMA fail threshold for 2 additional consecutive trips.</p>	<p>&gt; 0.60 (EWMA Fail Threshold)</p> <p><math>\leq 0.35</math> (EWMA Re-Pass Threshold)</p>	<p>Fuel Level Drive Time Drive length ECT Baro Odometer Time since last complete test</p> <p>if normalized result and EWMA is passing</p> <p>OR</p> <p>Time since last complete test</p> <p>if normalized result or EWMA is failing</p> <p>Estimated ambient temperature at end of drive</p> <p>Estimate of Ambient Air Temperature Valid</p> <p><b>Conditions for Estimate of Ambient Air Temperature</b>  <b>1. Cold Start</b>                      Startup delta deg C (ECT-IAT) <math>\leq 8^\circ\text{C}</math>                      OR  <b>2. Short Soak and Previous EAT Valid</b>                      Previous time since engine off <math>\leq 7200</math> seconds                      AND                      Must expire Estimate of Ambient Temperature Valid Conditioning Time. <b>Please see "P0442: Estimate of Ambient Temperature Valid Conditioning Time" in Supporting Tables Tab.</b></p>	<p><math>10\% \leq \text{Percent} \leq 90\%</math>  <math>\geq 600</math> seconds  <math>\geq 5.2</math> miles  <math>\geq 70^\circ\text{C}</math>  <math>\geq 70</math> kPa  <math>\geq 10.0</math> miles  <math>\geq 17</math> hours</p> <p><math>0^\circ\text{C} \leq \text{Temperature} \leq 34^\circ\text{C}</math></p> <p><math>\leq 8^\circ\text{C}</math></p> <p><math>\leq 7200</math> seconds</p> <p>Vehicle Speed <math>\geq 28</math> mph                      AND                      Mass Air Flow <math>\geq 0</math> g/sec</p>	<p>Once per trip, during hot soak (up to 2400 sec.).</p> <p>No more than 2 unsuccessful attempts between completed tests.</p>	<p>1 trip Type A EWMA</p> <p>Average run length is 7 under normal conditions</p> <p>Run length is 2 to 6 trips after code clear or non-volatile reset</p>

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		<p>completes. If the key is turned on while the diagnostic test is in progress, the test will abort.</p>		<p>Abort Conditions:</p>	<p>OR  <b>3. Not a Cold Start and Previous</b>                      Previous time since engine off                       AND                      Must expire Estimate of Ambient Temperature Valid Conditioning Time. <b>Please see "P0442: Estimate of Ambient Temperature Valid Conditioning Time" in Supporting Tables Tab.</b>                       OR  <b>4. Not a Cold Start and Previous</b>                      Previous time since engine off                      AND                      Must expire maximum value in Estimate of Ambient Temperature Valid Conditioning Time. <b>Please see "P0442: Estimate of Ambient Temperature Valid Conditioning Time" in Supporting Tables Tab.</b>                       OR  <b>5. Long Soak</b>                      Previous time since engine off   <b>1. High Fuel Volatility</b>                      During the volatility phase, pressure in the fuel tank is integrated vs. time. If the integrated pressure is                       then test aborts and unsuccessful attempts is incremented.                       OR  <b>2. Vacuum Refueling Detected</b>                      See P0454 Fault Code for information on vacuum refueling algorithm.                      OR  <b>3. Fuel Level Refueling Detected</b>                      See P0464 Fault Code for information on fuel level refueling.                      OR</p>	<p><b>EAT Valid and</b>                      7200 seconds &lt; Time &lt; 25200 seconds                       Vehicle Speed ≥ 28 mph                      AND                      Mass Air Flow ≥ 0 g/sec   <b>EAT Not Valid and</b>                      &lt; 25200 seconds                       Vehicle Speed ≥ 28 mph                      AND                      Mass Air Flow ≥ 0 g/sec                       ≥ 25200 seconds                       &gt; -5</p>		



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					<p><b>4. Vacuum Out of Range and No Refueling</b> See P0451 Fault Code for information on vacuum sensor out of range and P0464 Fault Code for information on fuel level refueling.</p> <p>OR</p> <p><b>5. Vacuum Out of Range and Refueling Detected</b> See P0451 Fault Code for information on vacuum sensor out of range and P0464 Fault Code for information on fuel level refueling.</p> <p>OR</p> <p><b>6. Vent Valve Override Failed</b> Device control using an off-board tool to control the vent solenoid, cannot exceed during the EONV test</p> <p>OR</p> <p><b>7. Key up during EONV test</b></p> <p>No active DTCs:</p>	<p>0.50 seconds</p> <p>MAF_Sensor Group ECT_Sensor Group IAT_Sensor Group VehicleSpeedSensor Group IgnitionOffTimeValid Map_Sensor Group P0443 P0446 P0449 P0452 P0453 P0455 P0462 P0463 P0496 P2610</p>		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Circuit (ODM)	P0443	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage	9 volts ≤ Voltage ≤ 18 volts	15 failures out of 20 samples	2 trips Type B
							100 ms /sample	
							OR	
							Chip protection logic indicates a short failure 1 time	
							Chip protection logic: 5 failures out of 10 samples indicate a sort	
							Frequency of this logic is 12.5 ms loop Continuous	
							Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	
							Continuous with solenoid operation	
Evaporative Emission (EVAP) Vent System Performance	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister.  This test runs with normal purge and vent valve is open.	Vent Restriction Prep Test: Vented Vacuum	< -623 Pa	Fuel Level System Voltage	10% ≤ Percent ≤ 90%	Once per Cold Start	2 trips Type B
			or  Vented Vacuum for 60 seconds	> 1245 Pa	Startup IAT	11 volts ≤ Voltage ≤ 18 volts		
			Vent Restriction Test: Tank Vacuum for 5 seconds BEFORE	> 2989 Pa	Startup ECT BARO	4 °C ≤ Temperature ≤ 30 °C ≤ 35 °C ≥ 74 kPa	Time is dependent on driving conditions	
			Purge Volume	≥ 6 liters	No active DTCs:	MAP_Sensor Group		
						VehicleSpeedSensor Group IAT_Sensor Group ECT_Sensor Group	Maximum time	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.			MAP_Sensor Group Throttle_Fault_Group  P0443 P0449 P0452 P0453 P0454	before test abort is 1000 seconds	
Evaporative Emission (EVAP) Vent Solenoid Control Circuit (ODM)	P0449	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage	9 volts ≤ Voltage ≤ 18 volts	50 failures out of 63 samples 100 ms / sample Continuous with solenoid operation	1 trips Type A
Fuel Tank Pressure (FTP) Sensor Circuit Performance	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	<p>The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts)</p> <p>Upper voltage threshold (voltage addition above the nominal voltage)</p> <p>Lower voltage threshold (voltage subtraction below the nominal voltage)</p> <p>The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with a EWMA (with 0= perfect pass and 1=perfect fail).</p> <p>When EWMA is</p> <p>, the DTC light is illuminated. The DTC light can be turned off if the EWMA is</p>	<p>0.2 volts</p> <p>0.2 volts</p> <p>&gt; 0.73 (EWMA Fail Threshold)</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes		<p>This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.</p>	<p>1 trip Type A EWMA</p> <p>Average run length: 6</p> <p>Run length is 2 trips after code clear or non-volatile reset</p>

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			and stays below the EWMA fail threshold for 2 additional consecutive trips.	≤ 0.40 (EWMA Re-Pass Threshold)				
Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage	P0452	This DTC will detect a fuel tank pressure sensor signal that is too low out of range.	Fuel tank pressure sensor signal  The normal operating range of the fuel tank pressure sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~3736 Pa).	< 0.15 volts (3 % of Vref or ~ 1681 Pa)	Time delay after sensor power up for sensor warm-up  ECM State ≠ crank	is 0.10 seconds	80 failures out of 100 samples  100 ms / sample  Continuous	2 trips Type B
Fuel Tank Pressure (FTP) Sensor Circuit High Voltage	P0453	This DTC will detect a fuel tank pressure sensor signal that is too high out of range.	Fuel tank pressure sensor signal  The normal operating range of the fuel tank pressure sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~3736 Pa).	> 4.85 volts (97% of Vref or ~ 4172 Pa)	Time delay after sensor power up for sensor warm-up  ECM State ≠ crank	is 0.10 seconds	80 failures out of 100 samples  100 ms / sample  Continuous	2 trips Type B
Fuel Tank Pressure (FTP) Sensor Circuit Intermittent	P0454	This DTC will detect intermittent tank vacuum sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.  The abrupt change is defined as a change in vacuum:	112 Pa < Vacuum < 249 Pa	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes		This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period.  The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.  The test will report a failure if 1 out of 3 samples are	1 trips Type A



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel Level Sensor 1 Circuit High Voltage	P0463	This DTC will detect a fuel sender stuck out of range high in the primary fuel tank.	Fuel level Sender A/D Counts	> 153 A/D Counts	Run/Crank Voltage	11 volts ≤ Voltage ≤ 18 volts	25.0 s  100 ms / sample Continuous	2 trips Type B
Fuel Level Sensor 1 Circuit Intermittent	P0464	This DTC will detect intermittent fuel level sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	<p>If a change in fuel level is detected, the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that an actual refueling event occurred. If a refueling event is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.</p> <p>An intermittent change in fuel level is defined as: The fuel level changes and does not remain</p> <p>for 30 seconds during a 600 second refueling rationality test.</p>	<p>by 10 % &gt; 10 %</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes		<p>This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.</p> <p>The test will report a failure if 1 out of 3 samples are failures.</p>	1 trip Type A

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Cooling Fan 1 Relay Control Circuit (ODM)	P0480	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage	9 volts ≤ Voltage ≤ 18 volts	15 failures out of 20 samples 100 ms / sample  OR  chip protection logic indicates a short failure 1 time  Chip protection logic: 5 failures out of 10 samples indicate a short  Frequency of this logic is 12.5 ms loop Continuous  Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip.	2 trips Type B
							Continuous with fan operation	
Cooling Fan 1 Relay Control Circuit (ODM)	P0481	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage	9 volts ≤ Voltage ≤ 18 volts	15 failures out of 20 samples	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							100 ms / sample OR chip protection logic indicates a short failure 1 time Chip protection logic: 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. Continuous with fan operation	
Evaporative Emission (EVAP) System Flow During Non-Purge	P0496	This DTC will determine if the purge solenoid is leaking to engine manifold vacuum. This test will run with the purge valve closed and the vent valve closed.	Tank Vacuum for 5 seconds BEFORE Test time	> 2491 Pa ≥ 60 seconds (on cold start)	Fuel Level System Voltage BARO Startup IAT Temperature Startup ECT No active DTCs:	10% ≤ Percent ≤ 90% 11 volts ≤ Voltage ≤ 18 volts ≥ 74 kPa 4 °C ≤ Temperature ≤ 30 °C ≤ 35 °C VehicleSpeedSensor Group IAT_Sensor Group ECT_Sensor Group MAP_Sensor Group Throttle_Fault_Group	Once per cold start Cold start: max time is 1000 seconds	2 trips Type B



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0443 P0449 P0452 P0453 P0454		
Idle Air Control (IAC) System - RPM Too Low	P0506	This DTC will determine if a low idle exists.	RPM < (Desired RPM – a value from a look up table based on ECT)		<ul style="list-style-type: none"> <li>• EVAP Canister Purge Valve Stuck Open or Solenoid Control Circuit DTCs not active</li> <li>• No ECT_Sensor Group DTCs</li> <li>• No Fuel_Injector_Fault_Group DTCs</li> <li>• No Throttle_Fault_Group DTCs</li> <li>• No IAT_Sensor Group DTCs</li> <li>• No Fuel Trim DTCs</li> <li>• No MAF_Sensor Group DTCs</li> <li>• No Misfire DTCs</li> <li>• No VehicleSpeedSensor Group DTCs</li> <li>• No MAP_Sensor Group DTCs</li> </ul>		8.00 seconds per test  4 tests to fail; must leave enable criteria between each test  Frequency: Continuous after enable 100ms loop	2 trips type B
					<ul style="list-style-type: none"> <li>• ECT</li> <li>• System Voltage</li> <li>• IAT</li> <li>• Engine run time</li> <li>• BARO</li> <li>• TP Sensor</li> <li>• VSS</li> <li>• Catalyst Diagnostic Intrusive Test not active</li> <li>• Post O2 Diagnostic Intrusive Test not active</li> <li>• Transmission state hasn't changed in last 0.1 seconds</li> <li>• Above met for a time</li> </ul>	<ul style="list-style-type: none"> <li>&gt; -40.00 deg. C</li> <li>&gt; 9.00 volts and &lt; 18.00 volts</li> <li>&gt; -40.00 deg. C</li> <li>&gt; 1.00 seconds</li> <li>&gt; 60.00 kPa</li> <li>&gt; 0.80%</li> <li>&lt; 3.00 MPH</li> <li>&gt; 5 seconds</li> </ul>		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Idle Air Control (IAC) System - RPM Too High	P0507	This DTC will determine if a high idle exists.  Results in Limited Authority Mode if vehicle has Electronic Throttle Control	RPM > (Desired RPM + value from look up table based on ECT)		<ul style="list-style-type: none"> <li>• EVAP Canister Purge Valve Stuck Open or Solenoid Control Circuit DTCs not active</li> <li>• No ECT_Sensor Group DTCs</li> <li>• No Fuel_Injector_Fault_Group DTCs</li> <li>• No Throttle_Fault_Group DTCs</li> <li>• No IAT_Sensor Group DTCs</li> <li>• No Fuel Trim DTCs</li> <li>• No MAF_Sensor Group DTCs</li> <li>• No Misfire DTCs</li> <li>• No VehicleSpeedSensor Group DTCs</li> <li>• No MAP_Sensor Group DTCs</li> </ul>		8.00 seconds per test  4 tests to fail; must leave enable criteria between each test  Frequency: Continuous after enable 100ms loop	1 trip type A
					<ul style="list-style-type: none"> <li>• ECT</li> <li>• System Voltage</li> <li>• IAT</li> <li>• Engine run time</li> <li>• BARO</li> <li>• TP Sensor</li> <li>• VSS</li> <li>• Catalyst Diagnostic Intrusive Test not active</li> <li>• Post O2 Diagnostic Intrusive Test not active</li> <li>• Transmission state hasn't changed in last 0.1 seconds</li> <li>• Above met for a time</li> </ul>	> -40.00 deg. C > 9.00 volts and < 18.00 volts > -40.00 deg. C > 1.00 seconds > 60.00 kPa > 0.80% < 3.00 MPH > 5 seconds		
Control Module Read Only Memory (ROM)	P0601	This DTC will be stored if the calibration check sum is incorrect	Output state invalid		<ul style="list-style-type: none"> <li>• PCM state</li> <li>• Ignition voltage</li> <li>• Engine speed</li> </ul>	crank or run > 5 volts < 5000	1 failure  Frequency: 50 ms loop Continuous	1 trip type A
Control Module Not Programmed	P0602	This DTC will be stored if the PCM is a service PCM that has not been programmed.	Output state invalid		<ul style="list-style-type: none"> <li>• PCM state</li> <li>• PCM is identified through calibration as a Service PCM</li> </ul>	crank or run	Test is run at Powerup  Test also runs: Frequency: 100ms loop Continuous	1 trip type A

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Control Module Random Access Memory (RAM)	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 failure at key-up initialization. This check is on all GMPX RAM.  OR  Fault counter increments by 10 for every error, decrements by 1 for every pass; fail threshold = 20. This check is on the Desired Throttle Position RAM location and runs 12.5 ms continuous  OR  Fault counter increments by 10 for every error, decrements by 1 for every pass; fail threshold = 20. This check is on all GMPX RAM and runs 100 ms continuous	1 trip type A
ECM/PCM Processor	P0606	Indicates that the PCM has detected a TACM internal processor integrity fault	TACM 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	1 trip type A
5 Volt Reference 1 Circuit	P0641	This DTC detects if the 5 Volt supply is too high or too low	Adjusted Voltage	> 4.7 volts or < 4.39 volts	• PCM state	Run	Failed for 10.00 sec  Frequency: 100ms loop Continuous	2 trips Type B
Malfunction Indicator Lamp (MIL) Control Circuit (ODM)	P0650	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage	9 volts ≤ Voltage ≤ 18 volts	15 failures out of 20 samples for open or overtemperature	2 trip Type B No MIL

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Remote Vehicle Start is not active		100 ms / sample OR Chip protection logic indicates a short failure 1 time Chip protection logic: 5 failures out of 10 samples indicate a short Frequency of this logic is 12.5 ms loop Continuous Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. Continuous	
5 Volt Reference 2 Circuit	P0651	This DTC detects if the 5 Volt supply is too high or too low	Adjusted Voltage	> 4.7 volts or < 4.39 volts	• PCM state	Run	Failed for 10.00 sec Frequency: 100ms loop Continuous	2 trips Type B
Accelerator Pedal Position (APP) System	P1125	PCM determines a limp home mode of operation due to multiple accelerator pedal sensor faults.	1 or more APP sensors OR Difference between APP sensors	< 0.7 volts or > 4.5 volts  > 0.225 volts	• Ignition in Run or Crank. • Ignition voltage • Valid TACM - PCM serial data. • No TACM processor DTC.	> 5.23 V.	One occurrence.  Check runs every 18.75 ms.	1 trip type A
O2S Insufficient Switching Bank 1 Sensor 1	P1133	This DTC determines if the O2 sensor is no longer sufficiently switching.	Fault condition present if Half Cycle L/R or R/L Switches are below the threshold.  OR	H/C L/R switches < 50, or H/C R/L switches < 50,  OR S/T L/R switches < 3 or S/T R/L	No Active DTC's  Bank 1 Sensor 1 DTC's not active  Misfire Detected DTC not active	EOSD_System_Faults =P0030, P0053, P0131, P0132, P0134, =P0300	Sample time is 90 seconds  Frequency: Once per trip	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			If Slope Time L/R or R/L Switches are below the threshold.	switches < 3	POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test  System Voltage EGR Device Control  Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Green O2S Condition  O2 Heater Temp Learned Htr resistance  Engine Coolant IAT Engine Run Time Time since any AFM status change Time since Purge On to Off change Time since Purge Off to On change Purge duty cycle Engine airflow  Engine speed  Fuel Baro Throttle Position Low Fuel Condition Diag  Fuel Control State	= Not active = Not active = Not active = Not active = Not active  10 volts < system voltage < 18 volts = Not active  = Not active = Not active = Not active = False  -1280 °C < Calculated O2 Temp < 1280 °C = Valid  > 65 °C > -40 °C > 60 seconds  >= 0 % duty cycle 15 gps <= engine airflow <= 29 gps 1300 <= RPM <= 3000  >= 2 % = False  = Closed Loop		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Closed Loop Active LTM fuel cell Transient Fuel Mass  Baro <u>FUEL_Output_Control_Status</u> Fuel State Commanded Proportional Gain  <u>All of the above met for</u>  Time	= TRUE = Enabled  =Normal DFCO not active >=1.9999999553  > 0.8 seconds		
O2S Insufficient Switching Bank 1 Sensor 1	P1134	This DTC determines if the O2 sensor transition time between rich to lean and lean to rich is degraded	Transition time difference	< -60 msec or > 70 msec	No Active DTC's  Bank 1 Sensor 1 DTC's not active  Misfire Detected DTC not active   POVD intrusive test AIR intrusive test Fuel intrusive test Idle intrusive test EGR intrusive test  System Voltage EGR Device Control  Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Diag  Green O2S Condition  O2 Heater Temp Learned Htr resistance  Engine Coolant IAT Engine Run Time	EOSD_System_Faults =P0030, P0053, P0131, P0132, P0134, =P0300  = Not active = Not active = Not active = Not active = Not active  10 volts < system voltage< 18 volts = Not active  = Not active = Not active = Not active = False  -1280 °C <Calculated O2 Temp <1280 °C = Valid  > 65 °C > -40 °C > 60 seconds	Sample time is 90 seconds  Frequency: Once per trip	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Time since any AFM status change Time since Purge On to Off change Time since Purge Off to On change Purge duty cycle Engine airflow  Engine speed  Fuel Baro Throttle Position Low Fuel Condition Diag  Fuel Control State Closed Loop Active LTM fuel cell Transient Fuel Mass  Baro <u>FUEL Output Control Status</u> Fuel State Commanded Proportional Gain  <u>All of the above met for</u>  Time	>= 0 % duty cycle 15 gps <= engine airflow <= 29 gps 1300 <= RPM <= 3000  >= 2 % = False  = Closed Loop = TRUE = Enabled  =Normal DFCO not active >=1.9999999553  > 0.8 seconds		
EngineMetal OvertempActive	P1258	The objective of the algorithm is to protect the engine in the event of engine metal overtemperature, mainly due to loss of coolant	The ECM detects that the engine coolant has exceeded a threshold for certain amount of time.	Engine Coolant > 131 deg. C	P0117 and P0118 not active	Engine Run time > 5 seconds	Time that EMOP active must be true for P1258 to be set is 1 seconds	1 trip type A
Bypass Line Monitor	P1350	This diagnostic detects an open or short on the Electronic Spark Timing (EST) output circuits.	Fault is detected	Fault is detected	<ul style="list-style-type: none"> <li>Engine is running or cranking</li> <li>No P0350 (Ignition Coil Circuit) DTC Active.</li> </ul>		90 failure out of 100 samples  Frequency: Continuous 100 ms loop  Once the fault logic detects a failure, the diagnostic is turned off for the rest of the trip.	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Cold Start Emissions Reduction System Fault	P1400	Model based test computes exhaust thermal energy from elevated idle speed and retarded spark advance. Detects if the cold start emission reduction system has failed resulting in the delivered thermal energy being out of range.	Average desired accumulated exhaust energy - Average measured accumulated exhaust energy	< -4.3 kJ/s	<ul style="list-style-type: none"> <li>Vehicle speed</li> <li>Cold start emission reduction strategy is active.</li> </ul>	< 2 mph	100 ms loop	1 trip type A
			OR	Average desired accumulated exhaust energy - Average measured accumulated exhaust energy	> 0.3 kJ/s	<ul style="list-style-type: none"> <li>Throttle position</li> <li>Airflow per cylinder</li> <li>No DTCs set for the following systems: MAP_Sensor Group, MAF_Sensor Group, IAT_Sensor Group, ECT_Sensor Group, Misfire, EST_Fault_Group, Crank_Sensor_Fault_Group, Idle_Air_Fault_Group, Fuel_Injector_Fault_Group, TP sensor, VehicleSpeedSensor Group, 5 volt reference, PCM Memory, AIR_System Group</li> </ul>	<ul style="list-style-type: none"> <li>&lt; 0.5%</li> <li>&gt; 40 mg</li> </ul>	
Throttle Actuator Control (TAC) Module Throttle Actuator Position Performance	P1516	Indicates that the TAC Module has detected a throttle positioning error  OR  TACM cannot determine throttle positioning  OR  Both TP Sensors are invalid	Absolute value of the throttle error  OR  Commanded DTP has been stable for 5 seconds, and TACM can not hold +/- 2 degree tolerance for 200ms.  OR  PCM processor DTCs. OR TACM processor DTC.  OR  Both TP Sensor Circuit DTCs are set. OR PCM-TACM Serial Data DTC with any APP Sensor DTC or TP Sensor DTC.  [Throttle error = Measured throttle position - commanded throttle position]	>2 degrees for >200 ms with no change in Commanded Throttle Position. OR >2 degrees for >500 ms for throttle command changes > 2 degrees. OR > 5 degrees for >200 ms for throttle command changes > 5 degrees. OR > 5 degrees for > 300 ms as commanded throttle changes continuously (no step change)	<ul style="list-style-type: none"> <li>Ignition voltage</li> <li>Ignition in Run or Crank.</li> <li>Valid TACM - PCM serial data.</li> <li>Not in battery saver mode.</li> </ul>	> 5.23 V	One occurrence.  Check runs every 3 ms.	1 trip type A



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Control Module Throttle Actuator Position Performance	P2101	Indicates that the PCM has detected a throttle positioning error	Absolute value of the throttle error [Throttle error = Measured throttle position - modeled throttle position]	> 6%	<ul style="list-style-type: none"> <li>Ignition in Run or Crank</li> <li>TACM determines PCM Desired Throttle Position is valid.</li> <li>Not in battery saver mode.</li> <li>No Airflow Actuation DTC.</li> <li>(Engine Running = true) or (Ignition Voltage &gt; 8.5 volts).</li> <li>No Throttle Actuation DTC.</li> <li>No PCM-TACM Serial Data DTC.</li> <li>Both TP Sensor Circuit DTCs are not set.</li> <li>No PCM Processor DTCs.</li> <li>No TACM Processor DTC.</li> </ul>		<p>High counter increments by 2 for every throttle error &gt; 6%; decrements by 1 if 0% &lt; throttle error &lt;5%; decrements by 5 if 6% &lt; throttle error &lt;0%; clears if throttle error &lt; -6%.</p> <p>Check runs every 18.75 ms with TACM - PCM valid message received. Low counter increments by 2 for every throttle error &lt; -6%; decrements by 1 if -6% &lt; throttle error &lt;0%; decrements by</p>	1 trip type A
							<p>5 if 0% &lt; throttle error &lt;6%; clears if throttle error &gt; 6%.</p> <p>Check runs every 18.75 ms with TACM - PCM valid message received.</p>	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Throttle Actuator Control (TAC) Module Performance	P2108	<p>Indicates that TAC Module is unable to correctly read data from the flash memory.</p> <p>Indicates that TAC Module is unable to correctly write and read data to and from RAM.</p> <p>Indicates that the TAC Module has detected an internal processor integrity fault.</p>	<p>1) Power-up test fails to read/write data OR</p> <p>2) Maximum allowed Running Resets exceeded OR</p> <p>3) ROM checksum does not match expected checksum OR</p> <p>4) RAM data read does not match data written OR</p> <p>5) Failure of Interrupt process flag to match expected value OR</p> <p>6) Program is not executed in the proper order OR</p> <p>7) Primary and Redundant RAM variables disagree OR</p> <p>8) Primary and Redundant Indicated Pedal Position calculation difference &gt; 0.0% OR</p> <p>9) Math/Logic test fails to equate to a predetermined value OR</p> <p>10) Internal Register data read does not match data written OR</p> <p>11) Internal Timer fails to increment OR</p> <p>12) Watchdog Timer fails to increment OR</p> <p>13) Failure of Processor Stack pointer to zero at Main Loop.</p>		<ul style="list-style-type: none"> <li>• Ignition voltage</li> <li>• Ignition in Run or Crank.</li> <li>• Valid TACM - PCM serial data.</li> </ul>	> 5.23 V	<p>1) One occurrence Check runs at Reset initialization</p> <p>2) 10 occurrences during ignition cycle Check runs at Reset initialization</p> <p>3) One occurrence. Check runs at power up and every 60 seconds thereafter.</p> <p>4) One occurrence. Check runs at power up and every 800 milliseconds</p>	1 trip type A

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							thereafter  5) - 13) One occurrence.  Check runs every 3 milliseconds. Second Watchdog timer runs in 10 millisecond loop.	
Accelerator Pedal Position (APP) Sensor 1 Circuit	P2120	TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #1.  OR  TACM indicates an invalid minimum mechanical position for the APP sensor #1.  OR  TACM indicates reference voltage out of range.	1) Raw APP sensor signal  OR  2) APP sensor minimum mechanical stop voltage  OR  3) Reference Voltage	< 0.235 V or > 4.487 V   < 0.235 V   < 4.54 V or > 5.21 V	<ul style="list-style-type: none"> <li>Ignition voltage</li> <li>Ignition in Run or Crank.</li> <li>Valid TACM - PCM serial data.</li> <li>No TACM processor DTC.</li> </ul>	> 5.23 V.	1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133.  Check runs every 3 ms.	1 trip type A
Accelerator Pedal Position (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 indicates reference voltage out of range.	1) Raw APP sensor signal  OR  2) APP sensor minimum mechanical stop voltage  OR  3) Reference Voltage	< 0.235 V or > 4.487 V   < 0.235 V   < 4.54 V or > 5.21 V	<ul style="list-style-type: none"> <li>Ignition voltage</li> <li>Ignition in Run or Crank.</li> <li>Valid TACM - PCM serial data.</li> <li>No TACM processor DTC.</li> </ul>	> 5.23 V.	1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180.  Check runs every 3 ms.	1 trip type A





COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Post fuel cell Power Take Off EGR Intrusive diagnostic  All post sensor heater delays  All above met and then fuel is commanded Rich Fuel State  Purge duty cycle During Stuck Lean test the following can cause the test to abort Fuel State Fuel State Purge duty cycle	= enabled = not active = not active  = not active  Equivalence Ratio = 1.180176  = 0 % = DFCO = PE > 0 %		
O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	P2271	This DTC determines if the post catalyst O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which reduces delivered fuel to achieve the required lean threshold.	Post O2 sensor cannot achieve the lean threshold voltage.  AND  The Accumulated mass air flow monitored during the Stuck Rich Voltage Test is greater than the threshold before the above voltage threshold is met.	1) Post O2S signal >= 151.91 mvolts  AND  2) Accumulated air flow during stuck rich test > 400 grams.	No Active DTC's	EOSD_System_Faults P0131, P0137, P0151, P0157 P0132, P0138, P0152, P0158 P0134, P0140, P0154, P0160 P0053, P0054, P0059, P0060 P0135, P0141, P0155, P0161 P1133, P1153, P0133, P0153 Fuel_Trim_Fault_Group	Frequency: Once per trip	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition Low Fuel Condition Diag Engine Speed Engine Airflow Vehicle Speed Closed loop integral Closed Loop Active Evap Ethanol Post fuel cell Power Take Off EGR Intrusive diagnostic All post sensor heater delays Engine Run Time All above met and then fuel is commanded Lean Fuel State Purge duty cycle During Stuck Lean test the following can cause the test to abort Fuel State Fuel State Purge duty cycle	> 10 volts and < 18 volts = Valid = Not Valid = False 625 <= RPM <= 1750 3.203125 gps <= Airflow <= 15 gps 25 mph <= Veh Speed <= 85 mph 95.299999975 <= C/L Int <= 104.70000003 = TRUE not in control of purge not in estimate mode = enabled = not active = not active = not active >=300 seconds Equivalence Ratio = 0.8701172 = 0 % = DFCO = PE > 0 %		
Secondary AIR System Pressure Sensor Circuit Bank 1	P2430	This DTC detects a stuck in range pressure sensor signal when the AIR pump is commanded on.	Average Error and Signal Variation	< 0.5 kPa < 1.0 kPa	BARO Inlet Air Temp Coolant Temp	> 60 kPa > 4.4 deg C. > 4.4 deg C. < 50 deg C.	Stuck in range cumulative time > 5 seconds	2 trips Type B

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					System Voltage  MAF No active DTCs:	> 9 Volts  > 75 gm/s AIR_System Group  ControllerProcessorPerf FA P0641 P0651	Frequency: Once per trip when SAI pump commanded On	
Secondary AIR System Pressure Sensor Performance Bank 1	P2431	This DTC detects a skewed pressure sensor signal via a comparison of the AIR pressure sensor signal and estimated BARO, as well as an evaluation of the quality of the comparison.	Difference between AIR pressure sensor and BARO (Pump Commanded Off)  OR Difference between AIR pressure sensor and BARO (Pump Commanded On)	> 10 kPa < -10 kPa  > 50 kPa  disable conditions:	BARO Inlet Air Temp Coolant Temp  System Voltage  Skewed sensor cumulatative test weight is based on distance from the last Baro update Baro Skewed Sensor Weight Factor Table  MAF  No active DTCs:	> 60 kPa > 4.4 deg C. > 4.4 deg C. < 50 deg C.  > 9 Volts  > 75 gm/s Transfer Case not in 4WD Low AIR_System Group  MAF_Sensor Group ControllerProcessorPerf FA P0641 P0651	Skewed sensor cumulative test weight > 30 seconds  Continuous 100ms loop	2 trips Type B
Secondary AIR System Pressure Sensor Circuit Low Voltage Bank 1	P2432	This DTC detects an out of range low AIR pressure sensor signal	AIR Pressure Sensor signal	< 5 % of 5Vref disable  conditions:	No active DTCs:	ControllerProcessorPerf FA P0641 P0651	400 failures out of 1000 samples  12.5 ms loop Continuous	2 trips Type B



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Secondary AIR System Pressure Sensor Circuit Hi Voltage Bank 1	P2433	This DTC detects an out of range high AIR pressure sensor signal	AIR Pressure Sensor signal	> 95 % of 5Vref <b>disable</b>  <b>conditions:</b>	No active DTCs:	ControllerProcessorPerf FA P0641 P0651	400 failures out of 1000 samples  12.5 ms loop Continuous	2 trips Type B
Secondary AIR System Shut-off Valve Stuck Open Single Bank System	P2440	This DTC detects if one or both of the AIR system control valves is stuck open  This test is run during Phase 2 (Pump commanded On, valve commanded closed)	AIR pressure error  or	≤ Bank 1 Valve Pressure Error table  > 105 kPa          <b>disable</b> <b>conditions:</b>	BARO Inlet Air Temp Coolant Temp  System Voltage          MAF No active DTCs:	> 60 kPa > 4.4 deg C. > 4.4 deg C. < 50 deg C.  > 9 Volts  AIR diagnostic Phase 1 passed  <b>Conditional test weight is calculated by multiplying the following Factors</b> <b>Phase 2 Baro Test Weight Factor = .035</b> <b>Phase 2 MAF Test Weight Factor = .148</b> <b>Phase 2 System Volt Test Weight Factor = .859</b> <b>Phase 2 Ambient Temp Test Weight Factor = 0</b>  > 75 gm/s AIRSystemPressureSensor FA AIRValveControlCircuit FA AIRPumpControlCircuit FA MAF_Sensor Group MAP_Sensor Group IAT_Sensor Group ECT_Sensor Group P0300 P0420  ControllerProcessorPerf FA P0641 P0651 EST_Fault_Group Fuel_Injector_Fault_Group	Phase 2 Conditional test weight > 1.5 seconds       Frequency: Once per trip when AIR pump commanded On	2 trips Type B



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Current ignition off time < old ignition off time Current ignition off timer minus old ignition off timer	≠ 1 second				
O2Sensor Circuit Range/ Performance Bank 1 Sensor 1	P2A00	This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling.	Closed Loop O2S ready flag  A) O2S signal must be 1) O2S signal OR 2) O2S signal To set Closed Loop ready flag  Closed Loop O2S ready flag  B) Once set to ready O2S cannot be 1) O2S signal AND 2) O2S signal for time Then set Closed Loop ready flag	= False  > 599.9939 mvolts < 299.9969 mvolts = True  = True  > 299.9969 mvolts < 599.9939 mvolts > 10 seconds = False	No Active DTC's  System Voltage  Engine Speed  Engine Airflow  Engine Coolant Engine Metal Overtemp Active  Converter Overtemp Active  Decel Fuel Cut Off AFM Status Predicted Exhaust Temp (B1S1)  Engine run time Power Enrichment <b>All of the above met for</b>  Time	EOSD_System_Faults P0131, P0151 P0132, P0152  > 10 volts and < 18 volts 500 RPM <= Engine speed <= 3000 RPM 3.203125 gps <= Engine Airflow <= 30 >= 65°C = False  = False  = Not Active = All Cylinders active >= -1280°C  > 100 seconds = Not Active	200 failures out of 250 samples.  Frequency: Continuous 100msec loop	2 trips Type B

LOOKUP TABLES												
P0101: (Calculated Flow – Measured Flow)												
Calculated Airflow	Airflow Delta											
Grams_Air_0	15											
Grams_Air_40	20											
Grams_Air_80	25											
Grams_Air_120	35											
Grams_Air_160	35											
Grams_Air_200	35											
Grams_Air_240	35											
Grams_Air_280	400											
Grams_Air_320	400											
Grams_Air_360	400											
Grams_Air_400	400											
P0106 – Predicted MAP Max (kPa)												
	0 % TPS	10 % TPS	20 %TPS	30 % TPS	40 % TPS	50 % TPS	60 % TPS	70 % TPS	80 % TPS	90 % TPS	100 % TPS	
0 RPM	105	105	105	105	105	105	105	105	105	105	105	105
800 RPM	76.4	97.7	101.7	105	105	105	105	105	105	105	105	105
1600 RPM	72	89.1	94.2	105	105	105	105	105	105	105	105	105
2400 RPM	66.2	80.5	84.2	97.99805	105	105	105	105	105	105	105	105
3200 RPM	60	72.7	75.3	87.00195	102.002	105	105	105	105	105	105	105
4000 RPM	54.1	64.2	67.3	72.00195	100	105	105	105	105	105	105	105
4800 RPM	47.8	56.7	60.4	61.00098	88.99902	100	105	105	105	105	105	105
5600 RPM	40.8	47.8	54.1	57.99805	82.00195	95	105	105	105	105	105	105
P0106 – Predicted MAP Min (kPa)												
	0 % TPS	10 % TPS	20 % TPS	30 % TPS	40 % TPS	50 % TPS	60 % TPS	70 % TPS	80 % TPS	90 % TPS	100 % TPS	
0 RPM	22.9	25.8	36.4	25	43.99902	46.00098	47.00195	47.99805	50	55	55	55
800 RPM	18.1	19.5	26.9	25	43.99902	46.00098	47.00195	47.99805	50	55	55	55
1600 RPM	13	12.9	21.8	23.99902	43.99902	45	47.00195	47.99805	50	55	55	55
2400 RPM	10	10	19.2	18.99902	32.00195	45	45	47.99805	50	55	55	55
3200 RPM	10	10	17.2	15	26.00098	42.99805	45	47.99805	50	55	55	55

LOOKUP TABLES											
4000 RPM	10	10	15.5	11.00098	22.99805	37.00195	43.99902	45	50	55	55
4800 RPM	10	10	13.2	10	17.99805	28.99902	42.00195	43.99902	50	55	55
5600 RPM	10	10	11.7	10	16.00098	27.99805	40	43.99902	50	55	55
P0108 - Engine Run Time threshold (seconds)											
Power-up ECT	Time										
-30	242										
-15	188										
0	134										
15	80										
30	10										
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			
0 Load_In_Percent	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%		
10 Load_In_Percent	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%	31.88%		
20 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
30 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
40 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
50 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
60 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
70 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
80 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
90 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
100 Load_In_Percent	31.88%	31.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
P0401: Engine Run Time as a Function of Coolant Temperature Table:											
Coolant Temperature at Startrun	Engine Run Time (seconds)										
Deg_C_m40	120										
Deg_C_m30	120										
Deg_C_m20	120										
Deg_C_m10	120										

LOOKUP TABLES													
Deg_C__0		120											
Deg_C__10		65											
Deg_C__20		50											
Deg_C__30		50											
Deg_C__40		50											
Deg_C__50		50											
Deg_C__60		50											
Deg_C__70		45											
Deg_C__80		35											
Deg_C__90		20											
Deg_C_100		20											
Deg_C_110		20											
Deg_C_120		60											
Deg_C_130		65											
Deg_C_140		70											
P0420: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table													
Airflow in gps	Average BPW in milliseconds												
0	100.0029												
1	100.0029												
2	100.0029												
3	100.0029												
4	100.0029												
5	100.0029												
6	100.0029												
7	100.0029												
8	100.0029												
9	100.0029												
10	100.0029												
11	100.0029												

LOOKUP TABLES													
	12	100.0029											
	13	100.0029											
	14	100.0029											
	15	100.0029											
	16	100.0029											
P0420: Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table													
Airflow in gps		Average BPW in milliseconds											
	0	0											
	1	0											
	2	0											
	3	0											
	4	0											
	5	0											
	6	0											
	7	0											
	8	0											
	9	0											
	10	0											
	11	0											
	12	0											
	13	0											
	14	0											
	15	0											
	16	0											
P0116: Fail if power up ECT exceeds IAT by these values													
Power-up IAT Deg C		Fast Failure Temp Difference											
	-40	79.49219											
	-28	79.49219											
	-16	79.49219											
	-4	60											

LOOKUP TABLES		
	8	60
	20	39.76563
	32	39.76563
	44	30
	56	30
	68	30
	80	30
	92	30
	104	30
	116	30
	128	30
	140	30
	152	30
P0128: Maximum Accumulated Airflow for IAT and Start-up ECT conditions		
Power-up ECT Deg C	Primary Test	Alternate Test
-40	10890	10136
-28	10890	10136
-16	10890	10136
-4	10890	8972
8	10890	7808
20	9534	6644
32	8178	5480
44	6822	4316
56	5466	3152
68	4110	1988
80	2754	824
P0411: SL Threshold Bank 1 table		
Average MAF g/s	String Length average length	
0	12.5	
3	12.5	
6	12.5	



LOOKUP TABLES														
	9	12.5												
	12	12.5												
	15	12.5												
	18	12.5												
	21	12.5												
	24	12.5												
	27	12.5												
	30	12.5												
	33	12.5												
	36	12.5												
	39	12.5												
	42	12.5												
	45	12.5												
	48	12.5												
P2431: Baro Skewed Sensor Weight Factor														
Distance since last Baro Update in Km	Weighting Factor													
0	1													
2	0.75													
4	0.5													
6	0.25													
8	0													
10	0													
12	0													
14	0													
16	0													
18	0													
20	0													
22	0													
24	0													
26	0													
28	0													
30	0													
32	0													

LOOKUP TABLES																				
P2440: Bank 1 Valve Pressure Error table																				
Seconds	Min Avg Error Thresh																			
0	-1.499023																			
1	-2.5																			
2	-2.998047																			
3	-2.998047																			
4	-2.998047																			
5	-2.998047																			
6	-2.998047																			
7	-2.998047																			
8	-2.998047																			
P2444: Bank 1 Pump Pressure Error table																				
Seconds	Min Avg Error Thresh																			
0	1.499023																			
1	1.499023																			
2	1.499023																			
3	1.499023																			
4	1.499023																			
5	1.499023																			
6	1.499023																			
7	1.499023																			
8	1.499023																			
P0506:RPM deviation allowed as a function of ECT																				
ECT value	RPM																			
-40	300																			
-28	300																			
-16	300																			
-4	300																			
8	300																			

LOOKUP TABLES												
	20	100										
	32	100										
	44	100										
	56	100										
	68	100										
	80	100										
	92	100										
	104	100										
	116	100										
	128	100										
	140	100										
	152	100										
P0507:RPM deviation allowed as a function of ECT												
<u>ECT value</u>	<u>RPM</u>											
	-40	300										
	-28	300										
	-16	300										
	-4	300										
	8	300										
	20	300										
	32	200										
	44	200										
	56	200										
	68	175										
	80	175										
	92	175										
	104	175										
	116	175										
	128	175										
	140	175										
	152	175										

## FAULT BUNDLE DEFINITIONS

Fault Group	DTC #
AIR_System Group	P_0411
	P_2440
	P_2444
MAF_Sensor Group	P_0101
	P_0102
	P_0103
CAM_Sensor_Fault_Group	P_0340
	P_0341
Catalyst_Fault_Group	P_0420
ECT_Sensor Group	P_0117
	P_0118
	P_0125
	P_0116
Crank_Sensor_Fault_Group	P_0016
	P_0335
	P_0336
	P_0385
	P_0386
EGR_Control_Fault_Group	P_0401
	P_0403
	P_0404
	P_0405
	P_0406
	P_042E
ESC_Fault_Group	P_0325
	P_0327
	P_0332
EST_Fault_Group	P_0350
	P_0351
	P_0352
	P_0353
	P_1350
Fuel_Injector_Fault_Group	P_0201
	P_0202

FAULT BUNDLE DEFINITIONS

	P_0203
	P_0204
	P_0205
	P_0206
Fuel_Pump_Fault_Group	P_0230
Fuel_Trim_Fault_Group	P_0171
	P_0172
	P_0174
	P_0175
Idle_Air_Fault_Group	P_0506
	P_0507
MAP_Sensor_Group	P_0106
	P_0107
	P_0108
IAT_Sensor_Group	P_0112
	P_0113
Misfire_Fault_Group	P_0300
Oxygen_Sensor_Fault_Group	P_0036
	P_0131
	P_0132
	P_0133
	P_0134
	P_0135
	P_0137
	P_0138
	P_0139
	P_0140
	P_0141
	P_1133
	P_1134
	P_2270
	P_2271
	P_2A00
	P_0030
	P_0050

FAULT BUNDLE DEFINITIONS

	P_0053
	P_0054
PRNDL_Switch_Fault_Group	P_0705
	P_0706
	P_0833
	P_1810
Purge_Control_Fault_Group	P_0442
	P_0446
	P_0452
	P_0453
	P_0455
	P_0496
System_Voltage_Fault_Group	P_0560
	P_0620
	P_0621
	P_0622
Throttle_Fault_Group	P_0068
	P_0120
	P_0121
	P_0122
	P_0123
	P_0220
	P_0604
	P_0606
	P_1121
	P_1122
	P_1125
	P_1516
	P_2101
	P_2108
	P_2120
	P_2125
	P_2135
	P_2138
	P_2162

FAULT BUNDLE DEFINITIONS

	U_0107
Transmission_Fault_Group	P_0218
	P_0711
	P_0712
	P_0713
	P_0716
	P_0717
	P_0719
	P_0724
	P_0730
	P_0740
	P_0741
	P_0742
	P_0748
	P_0751
	P_0752
	P_0753
	P_0756
	P_0757
	P_0758
	P_0801
	P_0815
	P_0816
	P_0826
	P_0842
	P_0843
	P_0894
	P_0960
	P_0961
	P_0962
	P_0963
P_1527	
P_1750	
P_1811	
P_1814	

FAULT BUNDLE DEFINITIONS

	P_1815
	P_1816
	P_1817
	P_1818
	P_1819
	P_182A
	P_182C
	P_182D
	P_182E
	P_182F
	P_1876
	P_1877
	P_2761
	P_2771
VehicleSpeedSensor Group	P_0500
	P_0501
	P_0502
	P_0503
EOSD_System_Faults	Throttle_Fault_Group
	MAF_Sensor_Group
	MAP_Sensor_Group
	IAT_Sensor_Group
	ECT_Sensor_Group
	P_0128
	Purge_Control_Fault_Group
	P_0443
	P_0449
	AIR_System_Group
	Fuel_Injector_Fault_Group