ENGINE DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Cam Phaser Solenoid Circuit Fault	P0013	Checks the cam phaser solenoid circuit for electrical integrity	Output state invalid		10/20 counts 100 msec/count Continuous check	DTC Type B
VCP System Performance (VCP = variable cam phaser)	P0014	Detects a VCP system error by comparing desired and actual VCP position through all operating ranges of VCP control	Actual position/desired position difference is greater than 3.75 degrees when VCP is commanded and stabilization of 3 secs is met	No cam phaser DTCs VCP is commanded VCP commanded position is stable within 0.9 degrees for 1 sec System voltage ≥ 11 V	135/150 counts 100 msec/count Continuous check when VCP is commanded	DTC Type B

Camshaft Position Sensor-A Bank-1 Correlation
 	
(Non-Encoded Cam Sensor)
	P0016	Detects cam to crank misalignment by monitoring if cam sensor pulse occurs during the incorrect crank position
		
		(Cam to Crank Correlation Diagnostic)
			Cam sensor pulse occurs outside crank MedRes region:
			
			KaEPSD_Cnt_NE_CamPerf_Region_1 = 2 KaEPSD_Cnt_NE_CamPerf_Region_2 = 3
			
			The crank MedRes region is a certain number of crank sensor pulses. ECM throughput prohibits using every crank sensor pulse. Typical crank MedRes region is twice per cylinder, but varies in each engine.
				IF [CAM_TYPE = NON_ENCODED_CAM AND
				CAM_TYPE ≠ CSI_CAM AND
				CKP_MedRes_Active = TRUE AND
				Crank_Sync_Flag = Crank_In_Sync AND
				Fault_Pending[CMP_CKT_Perf] = FALSE
				AND
				Fault_Active[CMP_CKT] = FALSE AND
				Fault_Active[CKP_SnsrA_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrA_Perf] = FALSE AND
				Fault_Active[CKP_SnsrB_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrB_Perf] = FALSE AND
				Fault_Active[CKP_SnsrAB_Corr] = FALSE]
				THEN
				ENABLE DIAGNOSTIC
				ELSE
				DISABLE DIAGNOSTIC
				ENDIF
					8 cam pulses out of the last 10 cam sensor pulses are outside malfunction criteria
					
					Continuous check
						DTC Type B

Camshaft Position Sensor-B Bank-1 Correlation
 	
(Encoded Cam Sensor)
	P0017	Detects cam to crank misalignment by monitoring if cam sensor pulse occurs during the incorrect crank position
		
		(Cam to crank Correlation Diagnostic)
			Cam sensor pulse < 97.63 degrees or > 113.22 degrees before LoRes crank pulse	IF[CAM_TYPE = ENCODED_CAM AND
				CAM_TYPE ≠ CSI_CAM AND
				Engine_Running = TRUE AND
				Crank_Sync_Flag = Crank_In_Sync AND
				Cam_Phaser_Position = PARKED AND
				Fault_Pending[CMP_CKT_Perf] = FALSE
				AND
				Fault_Active [CMP_CKT] = FALSE AND
				Fault_Active [CKP_SnsrA_Ckt] = FALSE AND
				Fault_Active [CKP_SnsrA_Perf] = FALSE
				AND
				Fault_Active [CKP_SnsrB_Ckt] = FALSE AND
				Fault_Active [CKP_SnsrB_Perf] = FALSE
				AND
				Fault_Active [CKP_SnsrAB_Corr] = FALSE]
				THEN
				ENABLE DIAGNOSTIC
				ELSE
				DISABLE DIAGNOSTIC
				ENDIF
					25 out of the last 35 cam rotations occur with 2 cam sensor pulses outside of malfunction criteria window
					
					Continuous check
						DTC Type B

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HO2S Heater Control Circuit Bank 1 Sensor 1	P0030	Monitor voltage at low side of heater circuit.	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	11 V < System voltage < 18 V Engine speed > 425 RPM	10 fails out of 12 samples @ 4 samples /sec Continuous check	DTC Type B
HO2S Heater Control Circuit Bank 1 Sensor 2	P0036	Monitor voltage at low side of heater circuit.	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	11 V < System voltage < 18 V Engine speed > 425 RPM	10 fails out of 12 samples @ 4 samples /sec Continuous check	DTC Type B
MAP/MAF/Throttle Position Correlation	P0068	Detect when manifold absolute pressure and measured airflow do not match estimated engine airflow as established by the TPS	1. Difference between measured MAP and estimated MAP < 25 kPa 2. Difference between measured MAF and estimated MAF < 25 grams/sec	Engine running No PCM processor, throttle actuation DTCs	187.5 msec Continuous in the main processor	DTC Type A
Mass Airflow (MAF) Sensor Performance	P0101	Determines if the MAF sensor is stuck within the normal operating range	1. Filtered airflow error > 15 grams/sec 2. Filtered manifold pressure 2 error > 20 kPa 3. Filtered throttle error < 350 kPa grams/sec	No MAF circuit, MAP circuit, EGR, ECT circuit, IAT circuit, crank sensor DTCs 400 RPM < Engine speed 70°C < ECT < 125°C -7°C < IAT < 125°C	Immediate <u>Frequency:</u> 12.5 msec loop Continuous check	DTC Type B
MAF Sensor Circuit Low Frequency	P0102	Detects a continuous short to low or open in either the signal circuit or the MAF sensor.	MAF sensor signal < 100 Hz	Engine run time > 5 secs Engine speed > 400 RPM 11 V < System voltage < 18 V Enable criteria stable time > 0.5 secs	30/40 counts 80 counts/sec Continuous check	DTC Type B
MAF Sensor Circuit High Frequency	P0103	Detects a continuous short to high in either the signal circuit or the MAF sensor.	MAF sensor signal > 11000 Hz	Engine run time > 5 secs Engine speed > 500 RPM 11 V < System voltage < 18 V Enable criteria stable time > 0.5 secs	30/40 counts 80 counts/sec Continuous check	DTC Type B
Manifold Absolute Pressure (MAP) Sensor 1 Performance	P0106	Determines if the MAP sensor is stuck within the normal operating range.	1. Filtered manifold pressure 1 error > 20 kPa 2. Filtered manifold pressure 2 error > 20 kPa 3. Filtered throttle error < 350 kPa grams/sec	No MAF circuit, MAP circuit, EGR, ECT circuit, IAT circuit, crank sensor DTCs 400 RPM < Engine speed 70°C < ECT < 125°C -7°C < IAT < 125°C	Immediate <u>Frequency:</u> 12.5 msec loop Continuous check	DTC Type B
MAP Circuit Low Input	P0107	Detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP < 1.0% of 5 V reference	No TPS, 5 V reference DTCs Controller State = RUN [(TPS ≥ 0% & Engine speed ≤ 1100 RPM) or (TPS ≥ 10% & Engine speed > 1100 RPM)]	320/400 counts 20 counts/sec Continuous check	DTC Type B
MAP Circuit High Input	P0108	Detects a continuous short to high or open in either the signal circuit or the MAP sensor.	MAP > 98.0% of 5 V reference	No TPS, 5 V reference DTCs Controller State = RUN Engine run time > table value based on start-up coolant temperature [(TPS < 29% & Engine speed ≤ 1100 RPM) or (TPS < 70% & Engine speed > 1100 RPM)]	320/400 counts 20 counts/sec Continuous check	DTC Type B

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IAT Sensor Circuit Low Voltage	P0112	This DTC determines if the IAT sensor is shorted low by checking for an IAT sensor resistance below a threshold	IAT resistance < 25 Ω	No ECT, VSS DTCs ECT < 110°C VSS ≥ 40 KPH Engine run time > 10 sec	50/100 counts 4 counts/sec Continuous check	DTC Type B
IAT Sensor Circuit High Voltage	P0113	Determines if the IAT sensor is shorted high by checking for an IAT sensor resistance above a threshold	IAT resistance > 1800000 Ω	No ECT, VSS, MAF DTCs set ECT ≥ 50°C VSS < 1.6 KPH MAF < 12 grams/sec Engine run time > 10 sec	50/100 counts 4 counts/sec Continuous check	DTC Type B
ECT Sensor Performance	P0116	This DTC detects if the engine coolant sensor is biased high while in range	A failure will be reported if any of the following occur: ECT at power up > IAT at power up by 100°C after a minimum 8 hour soak (fast fail). ECT at power up > IAT at power up by 15°C after a minimum 8 hour soak and a block heater has not been detected. ECT at power up > IAT at power up by 15°C after a minimum 8 hour soak and the time spent cranking the engine without starting is greater than 10 seconds with the fuel level being above a minimum level of 10%.	• No VSS DTCs • No IAT DTCs • No ECT sensor shorted DTCs • ECM/PCM Internal Engine Off Timer Performance DTC not active • Non-volatile memory failure has not been detected on power-up. • Engine off time > 8 hours • Test run this trip = false • Test aborted this trip = false Block heater detection: - ECT at power up > IAT at power up by 15°C - Power up IAT > 15°C Vehicle driven a minimum of 400 seconds above 25 mph and IAT drops more than 5° C from power up IAT.	Frequency: 100 ms loop Continuous	DTC Type B
ECT Sensor Circuit Low Voltage	P0117	Determines if the ECT sensor is shorted low by checking for an ECT sensor resistance below a threshold	ECT resistance < 25 Ω	No IAT DTCs IAT ≤ 70 °C Or Engine run time ≥ 10 sec	50/100 counts 1 count/sec Continuous check	DTC Type B
ECT Sensor Circuit High Voltage	P0118	Determines if the ECT sensor is shorted high by checking for an ECT sensor resistance above a threshold	ECT resistance > 1800000 Ω	No IAT DTCs IAT ≥ -7 °C Or Engine run time ≥ 60 sec	50/100 counts 1 count/sec Continuous check	DTC Type B
Throttle Position (TP) Sensor 1 Circuit	P0120	Detects a continuous or intermittent short or open in TP sensor #1 circuit	0.275 V > TPS > 4.725 V	Ignition in unlock/accessory, run or crank System voltage>5.23 V No PCM processor, 5 V reference DTCs	20/40 counts; 10 counts continuous; 12.5 msec /count in the motor processor	DTC Type A
Throttle Position (TP) Sensor 1 Performance	P0121	Determines if the TP sensor is stuck within the normal operating range	1. Filtered throttle error > 350 kPa grams/sec 2. Filtered manifold pressure 2 error < 20 kPa	No MAF circuit, MAP circuit, EGR, ECT circuit, IAT circuit, crank sensor DTCs 400 RPM < Engine speed 70°C < ECT < 125°C -7°C < IAT < 125°C	Immediate Frequency: 12.5 msec loop Continuous	DTC Type B

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Throttle Position (TP) Sensor 1 Circuit OOR Low	P0122	Detects a continuous or intermittent short or open in TP sensor #1 circuit	0.275V > Raw TPS sensor signal	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No Vref Fault	20/40 Counts 10 Counts Continuous 12.5 ms /Ct in the MCP	DTC Type A MIL
Throttle Position (TP) Sensor 1 Circuit OOR High	P0123	Detects a continuous or intermittent short or open in TP sensor #1 circuit	Raw TPS sensor signal > 4.725 V	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No Vref Fault	20/40 Counts 10 Counts Continuous 12.5 ms /Ct in the MCP	DTC Type A MIL
Engine Coolant Temperature (ECT) Insufficient for Closed Loop Fuel Control	P0125	Detects if the engine coolant temperature rises too slowly due to an ECT sensor or cooling system fault	Actual accumulated airflow > predicted accumulated airflow and engine coolant temperature > -7°C Airflow is accumulated every sec if 7 grams/sec < MAF < 55 grams/sec	No MAF, IAT, VSS, ECT circuit DTCs Start up ECT < 75°C Minimum average airflow > 0 grams/sec VSS > 5 MPH for 1 kilometer 30 secs < Engine run time < 1800 secs IAT ≥ 7 °C	30 secs 1 sec loop <u>Frequency:</u> Once per ignition cycle	DTC Type B
Engine Coolant Temperature (ECT) Below Thermostat Regulating Temperature	P0128	Detects if the engine coolant temperature rises too slowly due to an ECT sensor or cooling system fault	Actual accumulated airflow > predicted accumulated airflow and engine coolant temperature > 80°C Airflow is accumulated every sec if 7 grams/sec < MAF < 55 grams/sec	No MAF, IAT, VSS, ECT circuit DTCs Start up ECT < 80 °C Minimum average airflow > 0 grams/sec VSS > 5 MPH for 1 kilometer 30 secs < Engine run time < 1800 secs IAT ≥ -7 °C	30 secs 1 sec loop <u>Frequency:</u> Once per ignition cycle	DTC Type B
HO2S Closed Loop Rationality (bank 1 sensor 1)	P0130	Determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling	Closed loop fuel control O2 sensor Ready flag set to “Not Ready”. O2 sensor voltage must be > 550 mV or < 350 mV for 10 counts to set closed loop fuel O2 ready flag. Once set to “Ready,” the O2 sensor voltage cannot be > 350 mV and < 550 mV for >10 secs or the O2 ready flag will be reset to “Not Ready”.	No injector, MAF, ETC, TPS, MAP, ECT, HO2S Bank 1 Sensor 1 DTCs Engine run time > 200 secs Coolant temp > 70 °C 11 V < System voltage < 18 V Traction control not active Catalyst protection mode not active 1000 RPM ≤ Engine speed ≤ 3400 RPM 10.0 grams/sec ≤ MAF ≤ 50.0 grams/sec Decel fuel cut off not active Power enrichment not active Engine metal overtemp not active Above conditions must be met for 2 secs	400 /500 counts 100 msec/count Continuous check	DTC Type B

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HO2S Circuit Low Voltage (bank 1 sensor 1)	P0131	Determines if the O2 sensor or circuit is shorted to low by checking sensor voltage.	O2 sensor voltage < 50 mV OR O2 sensor voltage < 550 mV while in power enrichment	No injector, MAF, ETC, TPS, MAP, ECT, IAT, Evap DTCs Catalyst diagnostic test not active Traction control not active Fuel level > 10% 11 V < System voltage < 18 V Lean Test Closed Loop Fuel Enabled 14.5 ≤ commanded Air/Fuel ratio ≤ 14.8 15% ≤ TP ≤ 50 % Above conditions must be met for 2 secs Lean in PE Test Power enrichment mode enabled Above conditions must be met for 2 secs	Lean Test 950/1000 counts 10 counts/sec Continuous check Lean in PE Test 95/100 counts 10 counts/sec Runs during each occurrence of PE	DTC Type B
HO2S Circuit High Voltage (bank 1 sensor 1)	P0132	Determines if the O2 sensor or circuit is shorted to high by checking sensor voltage.	O2 sensor voltage > 1000 mV OR O2 sensor voltage > 350 mV while in DFCO	No injector, MAF, ETC, TPS, MAP, ECT, IAT, Evap DTCs Catalyst diagnostic test not active Traction control not active 11 V < System voltage < 18 V Fuel level > 10% Rich Test Closed loop fuel enabled 14.5 ≤ Air/Fuel ratio ≤ 14.8 0% ≤ TP ≤ 50 % Above conditions must be met for 2 secs Rich in DFCO Test Decel fuel cut-off mode enabled Above conditions must be met for 2 secs	Rich Test 140/150 counts 10 counts/sec Continuous check Rich in DFCO Test 95/100 counts 10 counts/sec Runs during each occurrence of DFCO	DTC Type B
HO2S Circuit Slow Response (bank 1 sensor 1)	P0133	Determines if the O2 sensor functioning properly by checking its response time.	O2 sensor average transition time: L/R >200 msec Or R/L >200 msec 350 mV < O2 voltage < 650 mV	No misfire, injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT DTCs set Catalyst diagnostic test not active Closed loop fuel enabled Traction control not active No injectors are disabled Fuel level > 10% 11 V < System voltage < 18 V Engine run time > 200 secs ECT > 70°C 1000 RPM < Engine speed< 3500 RPM 15.0 grams/sec < MAF < 50.0 grams/sec TP ≥ 5 % BLM cell number = 5, 6, 9, 10, 26 or 30 Transmission not in park, reverse or neutral Above conditions met for 2 secs	120 secs Once per key cycle	DTC Type B

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HO2S Circuit Insufficient Activity (bank 1 sensor 1)	P0134	Determines if the O2 sensor or the O2 sensor circuit has developed an open.	400 mV< O2 sensor voltage < 500 mV	No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT, front O2 heater DTCs set Catalyst diagnostic test not active Traction control not active 11 V < System voltage < 18 V Engine run time > 200 secs Minimum 3 occurrences of a delta TP sensor > 1 % during diagnostic test	950/1000 counts 10 counts/sec Continuous check	DTC Type B
HO2S Heater Circuit (bank 1 sensor 1)	P0135	Determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	RCOHT Learn Diagnostic Cold start 3.7 Ω < calculated heater resistance < 8.9 Ω Current Monitor Diagnostic During Warm Operation .73 amps < heater current <2.7 amps	No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT, Catalyst monitor DTCs set 11 V < System voltage < 18 V Traction control not active RCOHT Learn Diagnostic Engine Off Time > 10 hours -30°C < ECT < 45°C Delta between Coolant and IAT < 140°C Current Monitor Diagnostic Engine run time >230 secs ECT > 70°C 1000 RPM < Engine speed < 2500 RPM 15 grams/sec < MAF < 30 grams/sec O2 heater overtemp control not active. Above conditions must be met for 1 sec	RCOHT Learn Diagnostic Once per cold start Current Monitor Diagnostic 45/50 counts 10 counts/sec 2 tests per key cycle 20 sec delay between tests	DTC Type B
O2S Circuit (bank 1 sensor 2)	P0136	Determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic includes a passive (stage 1) test and an intrusive (stage 2) test. The stage 2 increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve a maximum voltage of 650 mV or a minimum voltage of 250 mV	No TPS, MAF, ETC, ECT, MAP, IAT, Evap, injector, fuel trim, AIR or other O2 DTCs 11 V ≤ system voltage ≤ 18 V Engine run time ≥ 2 secs Stage 2 Specific Enable Criteria Stage 1 portion of test not passed Engine run time ≥ 435 secs 1000 RPM ≤ Engine speed ≤ 5000 RPM 10 grams/sec ≤ MAF ≤ 100 grams/sec 30 KPH ≤ VSS ≤ 130 KPH All of the above met for at least 1 sec, and then: 0.95 ≤ Short term fuel trim ≤ 1.08 Fuel state = closed loop Evap diagnostic not in control of purge	Stage 1: Continuously Stage 2: Up to 10 secs for each threshold One test per trip	DTC Type B

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HO2S Circuit Low Voltage (bank 1 sensor 2)	P0137	Determines if the O2 sensor or circuit is shorted to low by checking sensor voltage.	O2 sensor voltage < 50 mV OR O2 sensor voltage < 650 while in power enrichment	No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT DTCs set Catalyst diagnostic test not active Traction control not active Fuel level > 10% 11 V < System voltage < 18 V Lean Test Closed loop fuel enabled 14.5 ≤ Air/Fuel ratio ≤ 14.8 15% ≤ TP ≤ 50 % Above conditions must be met for 2 secs Lean in PE Test Power enrichment mode enabled Above conditions must be met for 3 secs	Lean Test 950/1000 counts 10 counts/sec Continuous check Lean in PE Test 95/100 counts 10 counts/sec Runs during each occurrence of PE	DTC Type B
HO2S Circuit High Voltage (bank 1 sensor 2)	P0138	Determines if the O2 sensor or circuit is shorted to high by checking sensor voltage.	O2 sensor voltage > 1000 mV OR O2 sensor voltage > 300 mV while in DFCO	No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT DTCs set Catalyst diagnostic test not active Traction control not active Fuel level > 10% 11 V < System voltage < 18 V Rich Test Closed loop fuel enabled 14.5 ≤ Air/Fuel ratio ≤ 14.8 15% ≤ TP ≤ 50 % Above conditions must be met for 2 secs Rich in DFCO Test Decel fuel cut-off mode enabled Above conditions must be met for 3 secs	Rich Test 950/1000 counts 10 counts/sec Continuous check Rich in DFCO Test 95/100 counts 10 counts/sec Runs during each occurrence of DFCO	DTC Type B
HO2S Circuit Insufficient Activity (bank 1 sensor 2)	P0140	This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	425 mV < O2 sensor < 475 mV	No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT, rear O2 heater circuit DTCs set Closed Loop Fuel Enabled Catalyst diagnostic test not active Traction control not active 11 V < System voltage < 18 V Engine run time > 200 secs Minimum 3 occurrences of a delta TP sensor > 1 % during diagnostic test	950/1000 counts 10 counts/sec Once per key cycle	DTC Type B

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HO2S Heater Circuit (bank 1 sensor 2)	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	RCOHT Learn Diagnostic Cold start 3.6 Ω > calculated heater resistance > 10.3 Ω Current Monitor Diagnostic 0.6 amps < heater current <2.3 amps	No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT, Catalyst monitor DTCs set 11 V < System voltage < 18 V Traction control not active RCOHT Learn Diagnostic Engine Off Time > 10 hours -30°C < ECT <45°C Delta between Coolant and IAT < 140°C Current Monitor Diagnostic Engine run time > 230 secs ECT > 70°C 1000 RPM < Engine speed < 2500 RPM 15 grams/sec < MAF < 30 grams/sec O2 heater overtemp control not active. Above conditions must be met for 1 sec	45/50 counts 10 counts/sec 2 tests per key cycle; 20 sec delay between tests	DTC Type B
Fuel System Too Lean Bank 1	P0171	Determines if the fuel control system is in a lean condition.	The EWMA of long term fuel trim (LTM) samples ≥ 1.23999 for at least 2 secs (Note: EWMA stands for "Exponentially Weighted Moving Average") Notes: At least 35 secs of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 18 secs of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation.	No misfire, O2 sensor, Evap, injector, fuel temperature, fuel composition, IAC, MAF, MAP, ECT, EGR, AIR, TPS, TAC system DTCs 400 RPM < Engine speed <5700 RPM Baro > 70 kPa - 35°C < ECT < 125 °C 15 kPa < MAP <85 kPa -7°C < IAT < 145°C 1.0 grams/sec < MAF < 511 grams/sec VSS < 82 MPH Closed loop fueling Long term fuel trim learning enabled Not in device control EGR flow diagnostic intrusive test = Not Active Catalyst monitor intrusive test = Not Active Post O2 diagnostic intrusive test = Not Active Evap diagnostic is at any stage except the "tank pull down" portion of the test Fuel Level > 10 % (must be < 10% for at least 30 secs to disable; default is to enable if fuel sender is broken)	2 out 3 test failures Continuous check 100 msec loop	DTC Type B

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Fuel System Too Rich Bank 1	P0172	Determines if the fuel control system is in a rich condition.	The EWMA of long term fuel trim (LTM) samples < 0.79999 Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure: The EWMA of LTM samples with purge off < 0.79999 for at least 7 secs during each of 2 intrusive segments. General Notes: 1. At least 35 secs of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 18 secs of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. Intrusive Notes: Segments can last up to 35 secs, and are separated by the smaller of a 30 sec purge-on time or enough time to purge 18 grams of vapor. A maximum of 3completed segments are allowed for each intrusive test, and up to 30 intrusive attempts allowed per trip. After an intrusive test report is completed, another intrusive test cannot occur for 300 secs to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples > 0.79999 for at least 60 secs, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect Evap and FTP emissions, and the execution frequency of other diagnostics.	No misfire, O2 sensor, Evap, injector, fuel temperature, fuel composition, IAC, MAF, MAP, ECT, EGR, AIR, TPS, TAC system DTCs 400 RPM < Engine speed < 5700 RPM Baro > 70 kPa -35°C < ECT < 125°C 15 kPa > MAP < 85 kPa -7 °C < IAT < 145°C 1 gram/sec < MAF < 511 grams/sec VSS < 82 MPH Closed loop fueling Long term fuel trim learning enabled Not in device control EGR flow diagnostic intrusive test = Not Active Catalyst monitor intrusive test = Not Active Post O2 diagnostic intrusive test = Not Active Evap diagnostic is at any stage except the “tank pull down” portion of the test Fuel Level > 10 % (must be < 10% for at least 30 secs to disable; default is to enable if fuel sender is broken) <u>Intrusive Enable Criteria</u> The EWMA LTM samples < 0.80999 Engine speed > 400 RPM 1 grams/sec < MAF < 511 grams/sec 15 kPa < MAP <85 kPa <u>Temporary Intrusive Test Inhibit Criteria</u> If intrusive test segment exceeds 35 consecutive secs (in this case, purge valve is opened for the smaller of 30 secs or enough time to purge 18 grams vapor before attempting additional intrusive segments)	If rich fail counter is ≥ 3 before pass counter ≥ 3, diagnostic fails Continuous check 100 msec loop	DTC Type B
Fuel Injector 1 Control Circuit	P0201	Detects fuel injector circuit continuity	Injector driver feedback indication = fault	System voltage > 11 V for 5 secs	10/20 counts 4 counts/sec Continuous check	DTC Type B
Fuel Injector 2 Control Circuit	P0202	Detects fuel injector circuit continuity	Injector driver feedback indication = fault	System voltage > 11 V for 5 secs	10/20 counts 4 counts/sec Continuous check	DTC Type B

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Fuel Injector 3 Control Circuit	P0203	Detects fuel injector circuit continuity	Injector driver feedback indication = fault	System voltage > 11 V for 5 secs	10/20 counts 4 counts/sec Continuous check	DTC Type B
Fuel Injector 4 Control Circuit	P0204	Detects fuel injector circuit continuity	Injector driver feedback indication = fault	System voltage > 11 V for 5 secs	10/20 counts 4 counts/sec Continuous check	DTC Type B
Fuel Injector 5 Control Circuit	P0205	Detects fuel injector circuit continuity	Injector driver feedback indication = fault	System voltage > 11 V for 5 secs	10/20 counts 4 counts/sec Continuous check	DTC Type B
Throttle Position (TP) Sensor 2 Circuit	P0220	Detects a continuous or intermittent short or open in TP sensor #2 circuit	0.275 V > TPS > 4.725 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	15/35 counts; 10 counts continuous; 12.5 msec /count in the motor processor	DTC Type A
Throttle Position (TP) Sensor 2 Circuit OOR Low	P0222	Detects a continuous or intermittent short or open in TP sensor #2 circuit	0.275V > Raw TPS sensor signal	Ignition in Unlock/accessory, run, crank Ignition Voltage > 5.23 V No 5VR DTCs	15/35 Counts 10 Counts Continuous 12.5 ms / Ct in the MCP	DTC Type A MIL
Throttle Position (TP) Sensor 2 Circuit OOR High	P0223	Detects a continuous or intermittent short or open in TP sensor #2 circuit	Raw TPS sensor signal > 4.725 V	Ignition in Unlock/accessory, run, crank Ignition Voltage > 5.23 V No 5VR DTCs	15/35 Counts 10 Counts Continuous 12.5 ms / Ct in the MCP	DTC Type A MIL
Fuel Pump Relay Circuit Fault	P0230	Checks the fuel pump relay circuit for electrical integrity	Output state invalid		10/12 counts 10 counts/sec Continuous check	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Random Misfire Detected Cylinder 1 Misfire Cylinder 2 Misfire Cylinder 3 Misfire Cylinder 4 Misfire Cylinder 5 Misfire	P0300 P0301 P0302 P0303 P0304 P0305	Determine if a random misfire or a cylinder specific misfire is occurring by monitoring crankshaft velocity	Deceleration index Vs Engine speed Vs Load and Camshaft Position Emission Failure Threshold = 1% misfire Catalyst Damage Threshold = 5% - 18% misfire depending on engine speed and engine load.	Engine run time > 1 engine cycle No VSS, crank, TPS, MAP, ECT, MAF, ETC, PCM, cam, fuel sensing, throttle actuator, IAT DTCs Crankshaft position system variation must be learned or engine speed < 1000 RPM. Fuel cutoff not active Power management is not active Brake torque management not active Drag Control not active: N/A Fuel level > 2.5%. Disablement ends 88 engine cycles after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC -7 °C < ECT < 125°C If ECT at startup < -7°C disable until ECT > 21°C 450 RPM < Engine speed < 6200 RPM 9 V < System voltage < 18 V + TP delta < 95% per 100 msec - TP delta < 95% per 100 msec Abnormal engine speed is not present Excess engine acceleration is not present No rough road TCS is not active Positive and zero torque. Detectable engine speed and engine load region EGR intrusive test not active: N/A AIR intrusive test not active: N/A Cam sensor is in sync with crank sensor. Misfire diagnostic is not requesting to disable TCC when transmission is in hot mode Crankshaft ring filter inactive (after a low level misfire, another misfire may not be detectable until crankshaft ringing ceases)	Emission Exceedence = 5 failed 200 revolution blocks of 16. Failure reported with 1 exceedence in first 16*200 revolution block, or 4 exceedences thereafter 1st Catalyst Exceedence = Number of 200 revolution blocks as data supports for catalyst damage. 2nd and subsequent Catalyst Exceedences = 1 200 revolution block with catalyst damage. Failure reported with 3 exceedences in FTP, or 1 exceedence outside FTP. Frequency: Continuous	DTC Type B
Crankshaft Position System Variation Not Learned	P0315	Determine if the crankshaft position system variation has not been learned	Sum of compensation factors between 163709 and 163971	PCM state = Run Manufacturers enable counter must be 0	0.5 sec 100msec loop Continuous check	DTC Type A
Knock Sensor Circuit	P0325	Checks for knock sensor rationality	Knock sensor average voltage > 4.99 V or < 0.01 V	1800 RPM < Engine speed < 6400 RPM Air per Cylinder (load) > 65 grams	40/80 counts 10 counts/sec Continuous check	DTC Type B
Knock Sensor Circuit Excessive Spark Retard	P0326	Checks for knock sensor performance	Knock total retard ≥ a value that is a function of MAP and RPM	Knock detection = Enabled Engine speed > 1800 RPM MAP > 55 kPa	40/80 counts 10 counts/sec Continuous check	DTC Type B
Knock Sensor Circuit Low Voltage – Bank 1	P0327	Checks for knock sensor range	Knock sensor max cylinder voltage – min cylinder voltage ≤ 0.12 V	Engine speed > 1800 RPM Air per Cylinder (load) > 65 grams	80/100 counts 10 counts/sec Continuous check	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

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

Crankshaft Position Sensor-A Circuit	P0335	Crank Sensor Event Test
		Incorrect number of crank sensor pulses in a given number of cam sensor pulses
		
		Crank Time Without Match Test
		Excessive time without crank sensor match
			Crank Sensor Event Test
			90 > number of crank pulses > 110
			
			Crank Time Without Match Test
			See 'TIME LENGTH AND FREQUENCY' column
				Crank Sensor Event Test
				IF [(Engine Running = TRUE OR
				Engine Cranking = TRUE) AND
				(Primary_Cam_Sync_Flag = CAM_SIDE OR Primary_Cam_Sync_Flag = CAM_CYLINDER) AND
				PRIMARY_CAM_TYPE ≠ CSI_CAM) AND
				Fault Active [Primary Cam-Ckt] = FALSE
				AND
				Fault Active [Primary Cam-Perf] = FALSE]
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
				
				Crank Time Without Match Test
				IF [(Engine Running = TRUE OR
				Engine Cranking = TRUE) AND
				(Engine Speed Defaulted < 2000 RPM) AND
				{(Cranking Motor Is Engaged = TRUE AND
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
					Crank Sensor Event Test
					• One test = 10 cam sensor pulses
					• Fail report = 8/10 tests exceed malfunction criteria
					
					Crank Time Without Match Test
					• During engine crank = match has not occurred within the last 4 secs
					• During engine run = match has not occurred within the last 2 secs
						DTC Type B

Crankshaft Position Sensor-A Performance	P0336	Detects an excessive number of crank sensor resyncs	See 'TIME LENGTH AND FREQUENCY' column	IF [Engine Running = TRUE AND Engine Speed > 450 RPM]
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
					20 crank resyncs occur within 25 secs	DTC Type B

Camshaft Position Sensor-A Bank-1 Circuit	P0340	Detects cam sensor circuit malfunctions by monitoring for the absence of cam sensor pulses	See 'TIME LENGTH AND FREQUENCY' column	IF [MAF ≥ 0 AND
				[(Engine Cranking = TRUE AND
				Cam Sync Flag ≠ CAM_CYLINDER) OR
				Engine Running = TRUE]]
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
					1 cam pulse does not occur within 3 secs	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

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

Camshaft Position Sensor-A Bank-1 Performance	P0341	Detects cam sensor performance malfunctions by monitoring for the incorrect number of cam sensor pulses in a given number of crank sensor pulses	After Engine Start (slow event based)
			275 > cam sensor pulses > 325
			
			Near Engine Start (fast event based)
			2 > cam pulses > 4
				After Engine Start (slow event based)
				IF [{(CAM_TYPE ≠ CSI AND) } AND
				CKP_MedRes_Active = TRUE AND
				Crank_Sync_Flag = Crank_In_Sync AND
				Fault_Active[CMP_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrA_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrA_Perf] = FALSE AND
				Fault_Active[CKP_SnsrB_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrB_Perf] = FALSE AND
				Fault_Active[CKP_SnsrAB_Corr] = FALSE
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
				
				Near Engine Start (fast event based)
				IF[MedRes_CKP_Counter ≤ 10 AND
				CKP_MedRes_Active = TRUE AND
				Crank_Sync_Flag = Crank_In_Sync AND
				CAM_TYPE ≠ CSI_CAM AND
				Fault_Active[CMP-Ckt] = FALSE]
				THEN
				ENABLE DIAGNOSTIC
				ELSE
				DISABLE DIAGNOSTIC
				ENDIF
				
				Footnote: the crank MedRes counter increments when the diagnostic is enabled and counts the number of crank MedRes software interrupts. ECM throughput prohibits interrupting on every crank sensor pulse. Typical crank MedRes software interrupts occur twice per cylinder, but varies in each engine.
					After Engine Start
					One Test = 1000 MedRes software interrupts
					
					8 failed tests out of the last 10 tests
					
					Near Engine Start
					One Test = 10 MedRes software interrupts
					
					Fail Report = 1 failed test
						DTC Type B

Ignition Coil 1 Control Circuit	P0351	Checks the ignition coil control circuit for electrical integrity	Output state invalid	Ignition 1 is powered	20 failures for 100 cylinder events	DTC Type B
Ignition Coil 2 Control Circuit	P0352	Checks the ignition coil control circuit for electrical integrity	Output state invalid	Ignition 1 is powered	20 failures for 100 cylinder events	DTC Type B
Ignition Coil 3 Control Circuit	P0353	Checks the ignition coil control circuit for electrical integrity	Output state invalid	Ignition 1 is powered	20 failures for 100 cylinder events	DTC Type B
Ignition Coil 4 Control Circuit	P0354	Checks the ignition coil control circuit for electrical integrity	Output state invalid	Ignition 1 is powered	20 failures for 100 cylinder events	DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Ignition Coil 5 Control Circuit	P0355	Checks the ignition coil control circuit for electrical integrity	Output state invalid	Ignition 1 is powered	20 failures for 100 cylinder events	DTC Type B

Camshaft Position Sensor-B Bank-1 Circuit	P0365	Detects cam sensor circuit malfunctions by monitoring for the absence of cam sensor pulses	See 'TIME LENGTH AND FREQUENCY' column	IF[MAF ≥ 0 AND
				[(Engine_Cranking = TRUE AND
				Cam_Sync_Flag ≠ CAM_CYLINDER) OR
				Engine_Running = TRUE]]
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
					5 cam pulses do not occur within 3 secs	DTC Type B

Camshaft Position Sensor-B Bank-1 Performance	P0366	Detects cam sensor performance malfunctions by monitoring for the incorrect number of cam sensor pulses in a given number of crank sensor pulses	After Engine Start (slow event based)
			475 > cam sensor pulses > 525
			
			<u>Near Engine Start (fast event based)</u>
			4 > cam pulses > 6
				After Engine Start (slow event based)
				IF[{ (CAM_TYPE ≠ CSI AND) } AND
				CKP_MedRes_Active = TRUE AND
				Crank_Sync_Flag = Crank_In_Sync AND
				Fault_Active[CMP_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrA_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrA_Perf] = FALSE AND
				Fault_Active[CKP_SnsrB_Ckt] = FALSE AND
				Fault_Active[CKP_SnsrB_Perf] = FALSE AND
				Fault_Active[CKP_SnsrAB_Corr] = FALSE
				THEN
				Enable diagnostic
				ELSE
				Disable diagnostic
				ENDIF
				
				<u>Near Engine Start (fast event based)</u>
				IF[MedRes_CKP_Counter ≤ 10 AND
				CKP_MedRes_Active = TRUE AND
				Crank_Sync_Flag = Crank_In_Sync AND
				CAM_TYPE ≠ CSI_CAM AND
				Fault_Active[CMP-Ckt] = FALSE]
				THEN
				ENABLE DIAGNOSTIC
				ELSE
				DISABLE DIAGNOSTIC
				ENDIF
				
				Footnote: the crank MedRes counter increments when the diagnostic is enabled and counts the number of crank MedRes software interrupts. ECM throughput prohibits interrupting on every crank sensor pulse. Typical crank MedRes software interrupts occur twice per cylinder, but varies in each engine.
					After Engine Start
					One Test = 1000 MedRes software interrupts
					
					8 failed tests out of the last 10 tests
					
					Near Engine Start
					One Test = 10 MedRes software interrupts
					
					Fail Report = 1 failed test
						DTC Type B

ENGINE DIAGNOSTIC PARAMETERS

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Catalyst Low Efficiency - Bank 1	P0420	Oxygen Storage	OSC Time Difference ≥ 0.28 sec OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time) OSC Worst Pass Thresh = 2.7 sec (Manual transmission) 3.0 sec (Automatic transmission)	Trip Enable Criteria • No ECT DTCs • No VSS DTCs • No Fuel Trim DTCs • No TPS DTCs • No IAT DTCs • No MAP DTCs • No O2 Sensor DTCs • No MAF DTCs • No Cam Sensor DTCs • No Purge System DTCs • No Idle System DTCs • No Crank Sensor DTCs • IAT > - 20.5 °C • No Misfire DTCs Valid Idle Period Criteria • Engine Speed ≥ 1100 rpm for minimum of 42 sec since end of last idle period • Engine Run time ≥ 600 sec • Vehicle Speed ≤ 4 mph Test Enable Conditions • Closed loop fuel control • Tests Attempted this idle period < 1 • Transmission in a drive Gear (Automatic only) • No other intrusive diagnostics running • 450 °C ≤ Predicted Catalyst Temperature ≤ 700 °C • Barometric Pressure ≥ 68 kPa • -20.5 °C < IAT< 80 °C • 69 ≤ ECT ≤ 125 °C • System Voltage > 9 V • 0 < Idle Time ≤ 60 sec ⇒ Idle Time is incremented if: Vehicle Speed < 4 mph & Throttle Position (without IAC) ≤ 5 % • 2 ≤ Airflow ≤ 12 grams per second • Delta Throttle Position (with IAC) ≤ 50 % • Load Change ≤ 50 % • 0.88 ≤ Short Term Integrator Multiplier ≤ 1.12 • Short Term Integrator Multiplier Change ≤ 0.12 • 0.94≤ Average Short Term Integrator Multiplier ≤1.06 • Engine Speed variation ≤ 500 RPM • HO2S (bank1 sensor1) RtoL + LtoR transitions (450mv transition pt.) ≥ 4 • (Actual Engine RPM – Desired Engine RPM) ≤ 500 • (Desired Engine RPM – Actual Engine RPM) ≤ 500 • CCP DC Multiplier ≤ 1 Rapid Step Response Enable Criteria • OSC Time Difference Step ≥ 0.90 sec. • OSC Time Difference ≥ 0 sec. Green Converter Delay Criteria • Predicted catalyst temperature ≥ 500 °C for 3600 sec (non-continuously when vehicle is new. The diagnostic will not be enabled until the next ignition cycle after this criterion has been met. In addition, all other enable criteria must be met on the	1 test attempted per valid idle period Minimum of 1 test per trip. Rapid Step Response Maximum of 6 tests per trip. Maximum of 18 tests to detect failure when Rapid Step Response is enabled. Frequency: Execution Rate 12.5 ms	DTC Type A

ENGINE DIAGNOSTIC PARAMETERS

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Evap Emission System Leak Detection (Small Leak)	P0442	This DTC will detect a small leak (≥ 0.020") in the Evap system between the fuel fill cap and the purge solenoid. The DTC will also be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to test phase-1 or test phase-2 of the EONV test. The DTC will also be set if the refueling rationality test during EONV is failed.	Small Leak Test Fail Engine Off Natural Vacuum (EONV) The total pressure change achieved during the test is normalized against a target value = 1.5" water. The normalized value is entered into EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips. Fail threshold = 0.550 Re-Pass threshold = 0.35 Vacuum sensor out of range < 1.2 V or > 1.8 V: vacuum sensor out of range is reported as a perfect fail to the EWMA	Test Enable No VSS, ECT, IAT, Evap vacuum, CCP stuck open, Evap large leak. ignition off timer DTCs 15% < Fuel level < 85% No fuel filling during EONV • Increase of fuel level of 10% • Increase of tank pressure of 1 inch of H_2O per second • Maximum tank pressure of 3 inches of H_2O while engine is running and vent is open Valid Cold Start 4°C < ECT < 30°C 4°C < IAT < 30°C ECT-IAT< 8°C Baro > 74.0 kPa Estimated ambient temperature at end of drive > 2°C but < 32°C Drive time ≥ 10 minutes Drive length ≥ 5 km Coolant ≥ 70°C No fuel filling (fuel level increment ≥ 10%)	Once per cold start, during hot soak up to 2500 sec Time since last complete test ≥ 17 hours if EWMA is passing, or ≥ 10 hours if EWMA is failing No more than 2 attempts per day	DTC Type A EWMA
Canister Purge Circuit Fault	P0443	This DTC checks the canister purge solenoid circuit for electrical integrity	Output state invalid		100/120 counts 10 counts/sec Continuous check	DTC Type B
Evap Emission Control System - Vent Control Malfunction	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filter, vent hose or canister.	Excess Vacuum Test Vent solenoid commanded open Fuel Tank Vacuum ≥ 10 inches of H_2O for 2 seconds as monitored during initial purge ramp Cold Start Key-Up Test Vented Vacuum ≤ -2.5 inches of H_2O or Vented Vacuum ≥ 5.0 inches of H_20 for 3 secs after cold-start key-up	Test Enable No MAP, voltage, TPS, VSS, ECT, O2 sensor, IAT DTCs 15% < Fuel level < 85% 11 V < System voltage < 18 V Cold Start Test 4°C < ECT < 30°C 4°C < IAT < 30°C ECT-IAT< 8°C Baro > 74.0 kPa	Test must complete within 1000 secs from when vehicle is started Excess Vacuum Test – Stage II 180 secs Once per cold start	DTC Type B
Fuel Tank Vent Circuit Fault	P0449	This DTC checks the fuel tank vent solenoid circuit for electrical integrity	Output state invalid		100/120 counts 10 counts/sec Continuous check	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel Tank Pressure (FTP) Sensor Circuit Performance	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts) Upper voltage threshold (voltage addition above the nominal voltage): 0.2 volts Lower voltage threshold (voltage subtraction below the nominal voltage): 0.2 volts The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with an EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips. Fail threshold = 0.72998 Re-Pass threshold = 0.400024	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period. The length of the test is determined by the refueling rationality test that can take up to 600 seconds to complete.	DTC Type A EWMA
Evap Fuel Tank Pressure Sensor Circuit Low Voltage	P0452	This DTC will detect a Fuel tank pressure sensor that is to low out of range	Fuel tank pressure sensor signal < 0.1 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	• 0.10 second delay after sensor power up for sensor warm-up • ECM State ≠ crank	Frequency: Continuous 100ms loop	DTC Type B
Evap Fuel Tank Pressure Sensor Circuit High Voltage	P0453	This DTC will detect a Fuel tank pressure sensor that is to high out of range	Fuel tank pressure sensor signal > 4.9 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	• 0.10 second delay after sensor power up for sensor warm-up • ECM state ≠ crank	Frequency: Continuous 100ms loop	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel 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 > 0.45 and < 1249 Pa vacuum in the span of 1.0 seconds. A refueling event is confirmed if the fuel level has a persistent change of 20.0 % for 30 seconds. The test will report a failure if 2 out of 3 samples are failures.	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test that can take up to 600 seconds to complete.	DTC Type A
Evap Emission Control System – Malfunction	P0455	This DTC will detect a weak vacuum condition (large leak or purge restriction) in the Evap system	<u>Weak Vacuum Test- Stage I (Cold)</u> Tank vacuum < 8 inches of H_2O after the displaced purge volume has reached 15 liters. 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time <u>Weak Vacuum Test- Stage II (Warm)</u> Stage I test failed previous trip and this trip Passes if Tank vacuum > 8 inches of H_2O for 5 secs Note: Stage II can only report a pass	<u>Test Enable</u> No MAP, voltage, TPS, VSS, ECT, O2 sensor, IAT DTCs 15% < Fuel level < 85% 11 V < System voltage < 18 V Power-up Vacuum Test Fail = False <u>Cold Start Test</u> 4°C < ECT < 30°C 4°C < IAT < 30°C ECT-IAT< 8°C Baro > 74.0 kPa	<u>Weak Vacuum Test- Stage I:</u> Test must complete within 1000 secs after the vehicle is started <u>Weak Vacuum Test- Stage II:</u> Fault present for a time ≥ 600 secs; this is the maximum test time length. Once per cold start	DTC Type B
Fuel Level Sensor Circuit Performance	P0461	Fuel sender rationality check	Fuel level delta < 5 liters within 240 km		Continuous check	DTC Type B
Fuel Level Sensor Circuit Low Input	P0462	Detects a fuel sender failed to a low voltage level	Fuel level Sender % of 5V range < 6.25 %	Runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel Level Sensor Circuit High Input	P0463	Detects a fuel sender failed to a high voltage level	Fuel level Sender % of 5V range > 70%	Runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC 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.	If a change in fuel level is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem. The refuel event is defined as a change of 20.0 % fuel level during the engine-off test. A refueling event is confirmed if the fuel level has a persistent change of 20.0 % for 30 seconds. The test will report a failure if 2 out of 3 samples are failures.	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test that can take up to 600 seconds to complete.	DTC Type A
Evap. Emission Control System - Continuous Open Purge Flow	P0496	Determines if the purge solenoid is leaking to engine manifold vacuum.	Purge Valve Leak Test Purge valve closed Fuel Tank Vacuum > 10 inches of H_2O for 5 secs before purge time > 60 sec s (Fuel Tank Vacuum level dependent on fuel level)	Test Enable No MAP, voltage, TPS, VSS, ECT, O2 sensor, IAT DTCs 15% < Fuel level < 85% 11 V < System voltage < 18 V Power-up Vacuum Test Fail = False Cold Start Test 4°C < ECT < 30°C 4°C < IAT < 30°C ECT-IAT< 8°C Baro > 74.0 kPa	Once per trip Max engine run time is 65 secs	DTC Type B
VSS Circuit No Activity (Manual transmission)	P0502	Detects the lack of activity on the VSS circuit	Transmission output speed ≤ 100 RPM	No trans input speed, TP, or VSS intermittent DTCs TP ≥ 12 % 10 V < System voltage < 18 V 1000 RPM < Engine speed < 6800 RPM for 8 seconds 40 Nm < Engine torque < 300 Nm	3 seconds Continuous check	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
VSS Circuit Intermittent (Manual Transmission)	P0503	Detects an intermittent fault on the VSS circuit	Transmission output speed must drop by 1500 RPM in 0.5 secs	No trans input speed or shift solenoid A circuit DTCs Engine running 450 RPM < Engine speed < 6800 RPM for 8 seconds 10 V < System voltage < 18 V Time since the last gear change > 6 secs Time since transfer case gear change > 3 secs Transmission not in P/N Engine speed change < 500 RPM in 2 seconds	25 msec loop	DTC Type B
Idle System Low	P0506	Functional check of idle speed	Idle RPM > 75 RPM below desired RPM based on coolant temperature	General Test Enable No VSS DTCs 11 ≤ System voltage ≤ 18 V IAT ≥ -7 °C Baro ≥ 75 kPa ECT ≥ -7°C Engine run time ≥ 5 secs Closed loop fueling enabled Idle test: General conditions met Idle conditions present > 2 secs Time since park/neutral state change > 3 secs Time since TCC mode change > 3 secs Vehicle speed < 5 KPH	3 failed tests required to set fault; 5 secs per test Frequency: 250 msec Continuous check	DTC Type B
Idle System High	P0507	Functional check of idle speed	Idle RPM > 150 RPM above desired RPM based on coolant temperature	General Test Enable No VSS DTCs 11 ≤ System voltage ≤ 18 V IAT ≥ -7 °C Baro ≥ 75 kPa ECT ≥ -7°C Engine run time ≥ 22 secs Closed loop fueling enabled Idle test: General conditions met Idle conditions present > 2 secs Time since park/neutral state change > 3 secs Time since TCC mode change > 3 secs Vehicle speed < 5 KPH	1 failed test required to set fault; 15 secs per test Frequency: 250 msec Continuous check	DTC Type A
PCM Memory – Read Only Memory (ROM) Main and motor processor	P0601	Checks for proper function of the PCM memory	Computed EPROM checksum not equal to expected	Ignition in unlock/accessory, run or crank Ignition voltage > 5.23 V	1 failure during the first execution; 5 failures thereafter Background loop Continuous check	DTC Type A
PCM not Programmed	P0602	Checks for proper programmed state of the PCM	Calibration parameter not equal to expected value		1 failure Frequency 250 msec Continuous check	DTC Type A

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PCM Long Term Memory Reset	P0603	Non-volatile memory checksum error at controller power-up	Checksum at power-up does not match checksum at power-down		1 failure Once at power-up	DTC Type A
PCM Memory – Random Access Memory (RAM) Main and motor processor	P0604	Checks for proper function of the PCM memory	Bad RAM location found	Ignition in unlock/accessory, run or crank Ignition voltage > 5.23 V	100 failures if found during first test in ignition cycle 2 failures if found during subsequent tests in the ignition cycle Continuous check	DTC Type A

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PCM Processor 1. Processor Performance Check - Throttle limiting Fault (motor processor) 2. Processor Performance Check - ETC software is not executed in proper order 3. Processor Performance Check 4. Processor Performance Check - SPI failed 5. Processor Performance Check - motor processor state of health (Main) 6. Processor Performance Check - Learn Corruption Fault (Main motor processor) 7. Processor Performance Check - Learn Corruption Fault MAIN & motor processor 8. Processor Performance Check - motor processor state of health (Main) 9. Processor Performance Check - MAIN state of health (motor processor)	P0606	Indicates that the ECM has detected an ETC internal processor integrity fault	1. Motor processor desired throttle limiting occurring 2. ETC software is not executed in proper order 3. Software tasks loops > schedule tasks loop 4. Loss of SPI communication from the motor processor 5. 1.5 msec < Average motor processor state of health toggle > 2.5 msec 6. TPS or APPS minimum learned values fail compliment check 7. TPS or APPS minimum learned values fail range check 8. Motor processor integrity check error occurs 9. Motor processor integrity check error of main processor occurs	Ignition in unlock/accessory, run or crank System voltage >5.23 V	1. 99 counts continuous, 2 msec/count in the motor processor 2. 1 count continuous; 12.5 msec/count in the main processor 3. Error > 3 counts; 100 msec/count in the main processor 4. 160/400 counts or 15 counts continuous; 39 counts continuous @ initialization; 12.5 msec/count in the main processor 5. 3 counts continuous; 50 msec/count in the main processor 6. 100 msec in the main processor 7. 10 msec in the main processor 8. 4 counts continuous, 50 msec /count in the main processor 9. 2 count continuous, 12.5 msec/count in the main motor processor	DTC Type A

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Control Module Accelerator Pedal Position (APP) System Performance	P060D	1. Verify the PCMs ability to detect a short between the APPS 1 & 2 circuits 2. Verify that the indicated accelerator pedal position calculation is correct.	1. APPS #2 voltage > 2.05V 2. (main APPS – motor APPS) > 0V	Ignitions in unlock/ accessory and run, not during TPS minimum learn active during intrusive portion of diagnostic execution Ignition voltage > 5.23 V No PCM processor DTC	1. 2 counts; 156.25 msec w/immediate retest on an error, performed in the main processor 2. 99 counts continuous; 12.5 msec/count in the motor processor	DTC Type A

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Control Module Throttle Position (TP) System Performance	P060E	1. Verify the PCMs ability to detect a short between the TPS 1 & 2 circuits 2. Verify that the throttle control system position sensor short diagnostic is functioning	1. TPS #2 Voltage > 2.05V 2. No detection of the sensor short diagnostic active state	1. Ignition voltage > 5.23 V No PCM processor DTC. 2. Ignition in unlock/accessory or run, not during TPS minimum learn active during intrusive portion of diagnostic execution	1. 2 counts; 156.25 msec w/immediate retest on an error, performed in the main processor 2. No sensor short diagnostic activity for 498 msec; detected by the motor processor	DTC Type A

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PCM - EEPROM General Failure	P062F	Checks for a PCM non-volatile memory write error	Incorrect/unsuccessful write to non-volatile memory	Ignition in unlock/accessory, run, or crank Ignition voltage > 5.23 V	Immediately on next key up if flagged on previous key down Once at key down	DTC Type A

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5 Volt Reference 1 Circuit	P0641	Detects a continuous or intermittent short on the #1 5 V sensor reference circuit	Vref1 voltage -Vcc voltage > 0.125 V OR Vcc voltage -Vref1 voltage > 0.175 V	Ignition in unlock/accessory, run or crank Ignition voltage > 5.23 V No ECM processor DTCs	20/40 counts or 200 msec continuous; 12.5 msec/count in main processor 125/250 counts or 99 counts continuous; 2 msec/count in motor processor	DTC Type A
Malfunction Indicator Lamp (MIL) Control Circuit	P0650	This DTC checks the malfunction indicator lamp circuit for electrical integrity	Output state invalid		100/120 counts 10 counts/sec Continuous check	DTC Type B
5 Volt Reference 2 Circuit	P0651	Detects a continuous or intermittent short on the #2 5 V sensor reference circuit	Vref2 voltage -Vcc voltage > 0.125 V OR Vcc voltage –Vref2 voltage > 0.175 V	Ignition in unlock/accessory, run or crank Ignition voltage > 5.23 V No ECM processor DTCs	20/40 counts or 200 msec continuous; 12.5 msec/count in main processor 125/250 counts or 99 counts continuous; 2 msec/count in main processor	DTC Type A
Intake Rationality Cross-check Out of Range	P1101	This DTC determines if there are multiple air induction system problems affecting airflow and/or manifold pressure.	1. Filtered throttle error > 350 kPa grams/sec 2. Filtered manifold pressure 2 error > 20 kPa 3. [Filtered manifold pressure 1 error > 20 kPa or Filtered airflow error > 15 grams/sec]	No MAF circuit, MAP circuit, EGR, ECT circuit, IAT circuit, crank sensor DTCs 400 RPM < Engine speed 70°C < ECT < 125°C -7°C < IAT < 125°C	Immediate Frequency: 12.5 msec loop Continuous	DTC Type B

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HO2S Circuit Insufficient Switching (bank 1 sensor 1)	P1133	This DTC determines if the O2 sensor functioning properly by monitoring the number of L/R and R/L switches.	Slope Time L/R switches < 4 OR Slope Time R/L switches < 4 OR Half Cycle L/R switches < 100 OR Half Cycle R/L switches < 100 O2 voltage between 500 mV and 600 mV	No misfire, injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT DTCs set Catalyst diagnostic test not active Closed loop fuel enabled Traction control not active Fuel level > 10% 11 V < System voltage < 18 V Engine run time > 200 secs ECT > 70°C 1000 RPM < Engine speed < 3500 RPM 15 grams/sec < MAF < 50 grams/sec TP ≥ 5 % BLM cell number =5, 6, 9, 10, 26 or 30 Transmission not in park, reverse or neutral Above conditions met for 2 secs	120 secs of response data after enable Once per key cycle	DTC Type B
HO2S Transition Time Ratio (bank 1 sensor 1)	P1134	Determines if O2 sensor is functioning properly by checking asymmetry of response (rich-to-lean time minus lean-to-rich time)	O2 sensor average transition time difference: R/L – L/R > 90 ms Or R/L – L/R < -65 ms	No misfire, injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT DTCs set Catalyst diagnostic test not active Closed loop fuel enabled Traction control not active No injectors are disabled Fuel level > 10% 11 V < System voltage < 18 V Engine run time > 200 secs ECT > 70°C 1000 RPM < Engine speed< 3500 RPM 15.0 grams/sec < MAF < 50.0 grams/sec TP ≥ 5 % BLM cell number = 5,6,9,10,26 or 30 Transmission not in park, reverse or neutral Above conditions met for 2 secs	120 secs Once per key cycle	DTC Type B

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Throttle Actuator Control (TAC) Module - Throttle Actuator Position Performance	P1516	1. Detect a throttle positioning error. 2. Detect a throttle positioning error. 3. Detect excessive current draw on the actuator circuit. 4. Determine if the actuator has been miswired.	|Throttle error| ≥ |2%| after > 5 sec stability with no change in error sign, after 4 sec stable command. |Throttle error| > 10% (Actuator) > 9A TPS1< 2.36V	1-3. Ignition in run or crank [RPM>0 or (RPM=0 and not in battery saver mode)]. No airflow actuation, throttle actuation DTCs Engine running = true or System voltage > 6.5 V 4. Minimum TPS learn active state	1. 249 counts continuous; 2 msec/count in the motor processor 2. 99 counts continuous; 2 msec/count in the motor processor 3. 50 counts continuous; 2 msec/count in the motor processor 4. 99 counts continuous; 2 msec/count in the motor processor	DTC Type A
Control Module Throttle Actuator Position Performance	P2101	Detect a throttle positioning error	Difference between measured throttle position and modeled throttle position > 10%	Ignition in run or crank [RPM>0 or (RPM=0 and not in battery saver mode)] No airflow actuation, throttle actuation DTCs Engine running or Ignition voltage > 8 V	<u>Positive error counter</u> Increments by 3 if TP error > 10%; decrements by 2 if 0% < TP error< 10%; decrements by 2 if -10% < TP error < 0%; clears if TP error < -10%. <u>Negative error counter</u> Increments by 3 if TP error< -10%; decrements by 2 if -10%< TP error < 0%; decrements by 2 if 0% < TP error < 10%; clears if TP error > 10%. Thresholds are 45 Check runs every 12.5 msec in the main processor	DTC Type A

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Accelerator Pedal Position (APP) Sensor 1	P2120	Detect a continuous or intermittent short or open in the APP sensor #1	0.75 V > Raw APP 1 > 4.65V	Ignition in unlock/accessory, run or crank Ignition voltage >5.23 V No PCM processor, 5 V reference DTCs	1. 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor 2. 92/217 counts or 67 counts continuous; 2 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 OOR Low	P2122	Detect a continuous or intermittent short or open in the APP sensor #1.	Raw APP sensor signal is < 0.75 V	Ignition in unlock/accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	20/40 Counts or 10 Counts continuous 12.5 ms /Ct in the main µP 92/217 Counts or 67 Counts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 OOR High	P2123	Detect a continuous or intermittent short or open in the APP sensor #1.	Raw APP sensor signal is > 4.65V	Ignition in unlock/accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	20/40 Counts or 10 Counts continuous 12.5 ms /Ct in the main µP 92/217 Counts or 67 Counts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit	P2125	Detect a continuous or intermittent short or open in the APP sensor #2	0.75 V > Raw APP 2 > 4.65V	Ignition in unlock/accessory, run or crank Ignition voltage >5.23 V No PCM processor, 5 V reference DTCs	1. 15/35 counts or 10 counts continuous; 12.5 msec/count in the main processor 2. 92/217 counts or 67 counts continuous; 2 msec/count in the motor processor	DTC Type A

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Accelerator Pedal Position (APP) Sensor 2 Circuit OOR Low	P2127	Detect a continuous or intermittent short or open in the APP sensor #2.	Raw APP sensor signal is < 0.75 V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	15/35 Counts or 10 Counts continuous 12.5 ms / Ct in the main µP 92/217 Counts or 67 Counts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit OOR High	P2128	Detect a continuous or intermittent short or open in the APP sensor #2.	Raw APP sensor signal is > 4.65V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	15/35 Counts or 10 Counts continuous 12.5 ms / Ct in the main µP 92/217 Counts or 67 Counts continuous 2 ms/Ct in the MCP	DTC Type A
Throttle Position (TP) Sensor 1-2 Correlation	P2135	Detects a continuous or intermittent correlation fault between TP sensors #1 and #2	Difference between (raw min. learned TPS#1 voltage-raw min. TPS#1 voltage) and (raw TPS#2 voltage - raw min. learned TPS#2 voltage) < 5% offset at min. throttle position with an increasing to 10% at max. throttle position	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, TPS circuit DTCs	1. 15/35 counts or 12 counts continuous; 12.5 msec/count in the main processor 2. 92/217 counts or 67 counts continuous; 2 msec/count in the motor processor	DTC Type A

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Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P2138	1. Detect an invalid minimum mechanical position correlation between APP sensor #1 and #2 2. Detect a short between APP sensors #1 and #2 circuits.	1. Difference between (5V-raw learned min. APPS#2 voltage)*2 and (raw learned min. APPS#1 voltage) > 0.25 V at min throttle position to 0.5 V at max throttle position 2. Difference between APP#1 and APP#2 < 1 V	1. Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, APP sensor, 5 V reference DTCs 2. Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor DTCs	1. 15/35 counts or 12 counts continuous, 12.5 msec/count in the main processor. 92/217 counts or 80 counts continuous, 2 msec/count in the motor processor 2. 2 counts 156.25 msec w/ immediate test on an error, performed in the main processor	DTC Type A
Minimum Throttle Position Not Learned	P2176	TP minimum learning not completed	TPS > 0.82 V	Minimum TPS learn active state Stable throttle position reading for 40 msec Ignition in run or crank No TPS circuit DTCs	3 secs	DTC Type A
Control Module Ignition Off Timer Performance	P2610	Determines if the ignition off timer has failed	1. A failure will be reported if the following occurs 3 times: Ignition off time < 0 Or Ignition off time > 10 2. A failure will be reported if any of the following occur 15 times out of 20 tests: • Time since last ignition off timer increment > 1.39375 • Current ignition off time < Old ignition off time • Time between ignition off timer increments < 0.575 • Time between ignition off timer increments > 1.39375 • Current ignition off time - old ignition off Time =1	Test run this trip = FALSE Ignition off timer enabled = TRUE -40°C < IAT < 125°C	Frequency 100 msec loop Continuous check	DTC Type B