Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Heater Coolant Pump Control Circuit Open	B269A	Controller specific output driver circuit diagnoses the Heater Coolant Pump Control Circuit low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	Run Crank Ignition in Range Engine not cranking == Above is true and == Last Open Circuit Test	= True = True ==================== not Indeterminate	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips Note: In certian controlle rs B269C may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Heater Coolant Pump Control Circuit Low	B269C	Controller specific output driver circuit diagnoses the Heater Coolant Pump Control Circuit low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	Run Crank Ignition in Range Engine not cranking == Above is true and == Last Open Circuit Test	= True = True ==================== not Indeterminate	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips Note: In certian controllers B269A may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Heater Coolant Pump Control Circuit High	B269D	Controller specific output driver circuit diagnoses the Heater Coolant Pump Control Circuit low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power.	Run Crank Ignition in Range Engine not cranking == Above is true and == Last Open Circuit Test	= True = True ==================== not Indeterminate	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Actuator Solenoid Circuit Open – Bank 1	P0010	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft System Performance – Bank 1	P0011	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive.	(Intake cam Bank 1) Cam Position Error > (**P0011_CamPosErrorLimIc1**) deg	**Intake Cam Phsr Enable**	= TRUE	100.00 failures out of 300.00 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> (**P0011_CamPosErrorLimIc1**) deg AND < (**CalculatedPerfMaxIc1**) deg		
					Desired cam position variation	< 4.50 deg for (**P0011_P05CC_StablePositionTimeIc1**) seconds		
					No Active DTCs	P0010 P2088 P2089		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Actuator Solenoid Circuit Open – Bank 1	P0013	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft System Performance – Bank 1	P0014	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive.	(Exhaust cam Bank 1) Cam Position Error > (**P0014_CamPosErrorLimEc1**) deg	**Exhaust Cam Phsr Enable**	= TRUE	100.00 failures out of 300.00 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> (**P0014_CamPosErrorLimEc1**) deg AND < (**CalculatedPerfMaxEc1**) deg		
					Desired cam position variation	< 4.50 deg for (**P0014_P05CE_StablePositionTimeEc1**) seconds		
					No Active DTCs	P0013 P2090 P2091		

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 (mid-park phaser)	P0016	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 1 sensor A occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	2 cam sensor pulses less than or greater than nominal position in one cam revolution.	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0340, P0341 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 Trips

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 B (mid-park phaser)	P0017	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 1 sensor B occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	. 2 cam sensor pulses less than or greater than nominal position in one cam revolution..	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0365, P0366 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 Trips

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 2 Sensor A (mid-park phaser)	P0018	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 2 sensor A occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	2 cam sensor pulses less than or greater than nominal position in one cam revolution..	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	CrankSensor_FA P0345, P0346 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 Trips

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 2 Sensor B (mid-park phaser)	P0019	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 2 sensor B occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	2 cam sensor pulses less than or greater than nominal position in one cam revolution..	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0390, P0391 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Actuator Solenoid Circuit Open – Bank 2	P0020	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	System supply voltage is within limits. Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft System Performance – Bank 2	P0021	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive.	(Intake cam Bank 2) Cam Position Error > (**P0021_CamPosErrorLimIc2**) deg	**Intake Cam Phsr Enable**	= TRUE	100.00 failures out of 300.00 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> (**P0021_CamPosErrorLimIc2**) deg AND < (**CalculatedPerfMaxIc2**) deg		
					Desired cam position variation	< 4.50 deg for (**P0021_P05CD_StablePositionTimeIc2**) seconds		
					No Active DTCs	P0020 P2092 P2093		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Actuator Solenoid Circuit Open – Bank 2	P0023	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft System Performance – Bank 2	P0024	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive	(Exhaust cam Bank 2) Cam Position Error > (**P0024_CamPosErrorLimEc2**) deg	**Exhaust Cam Phsr Enable**	= TRUE	100.00 failures out of 300.00 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> (**P0024_CamPosErrorLimEc2**) deg AND < (**CalculatedPerfMaxEc2**) deg		
					Desired cam position variation	< 4.50 deg for (**P0024_P05CF_StablePositionTimeEc2**) seconds		
					No Active DTCs	P0023 P2094 P2095		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank 1 Sensor 1	P0030	Controller specific output driver circuit diagnoses the heater output low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0031 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank1 Sensor1	P0031	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0030 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank1 Sensor1	P0032	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank 1 Sensor 2	P0036	Controller specific output driver circuit diagnoses the heater output low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0037 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank1 Sensor2	P0037	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0036 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank1 Sensor2	P0038	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank 2 Sensor 1	P0050	Controller specific output driver circuit diagnoses the heater output low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0051 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank2 Sensor1	P0051	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0050 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank2 Sensor1	P0052	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HO2S Heater Resistance Bank 1 Sensor 1	P0053	Detects an oxygen sensor heater having an incorrect or out of range resistance value. This test calculates the heater's resistance (using voltage and current) at engine start after a longer soak condition and compares it to the expected values for the released sensor. This fault is set if the heater resistance is outside the expected range.	Heater Resistance outside of the expected range of	3.6 < ohms < 10.3	No Active DTC's Coolant – IAT Engine Soak Time Coolant Temp Ignition Voltage Engine Run time	ECT_Sensor_FA P262B IAT_SensorFA < 8.0 ºC > 28,800 seconds ≥ -30.0 ºC < 32.0 volts < 0.06 seconds	Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HO2S Heater Resistance Bank 1 Sensor 2) (For Dual Bank Exhaust Only	P0054	Detects an oxygen sensor heater having an incorrect or out of range resistance value. This test calculates the heater's resistance (using voltage and current) at engine start after a soak condition and compares it to the expected values for the released sensor. This fault is set if the heater resistance is outside the expected range.	Heater Resistance outside of the expected range of	3.6 < ohms < 10.3	No Active DTC's Coolant – IAT Engine Soak Time Coolant Temp Ignition Voltage Engine Run time	ECT_Sensor_FA P262B IAT_SensorFA < 8.0 ºC > 28,800 seconds ≥ -30.0 ºC < 32.0 volts < 0.06 seconds	Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank 2 Sensor 2	P0056	Controller specific output driver circuit diagnoses the heater output low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 200 K Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0057 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank2 Sensor2	P0057	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips Note: In certain controllers P0056 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Control Circuit Bank2 Sensor2	P0058	Controller specific output driver circuit diagnoses the heater output low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power.	Ignition Voltage Engine Speed	= Crank or Run > 11.0 volts > 400 RPM	20 failures out of 25 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HO2S Heater Resistance Bank 2 Sensor 1	P0059	Detects an oxygen sensor heater having an incorrect or out of range resistance value.. This test calculates the heater's resistance (using voltage and current) at engine start after a soak condition and compares it to the expected values for the released sensor. This fault is set if the heater resistance is outside the expected range.	Heater Resistance outside of the expected range of	3.6 < ohms < 10.3	No Active DTC's Coolant – IAT Engine Soak Time Coolant Temp Ignition Voltage Engine Run time	ECT_Sensor_FA P262B IAT_SensorFA < 8.0 ºC > 28,800 seconds ≥ -30.0 ºC < 32.0 volts < 0.09 seconds	Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HO2S Heater Resistance Bank 2 Sensor 2	P0060	Detects an oxygen sensor heater having an incorrect or out of range resistance value. This test calculates the heater's resistance (using voltage and current) at engine start after a soak condition and compares it to the expected values for the released sensor. This fault is set if the heater resistance is outside the expected range.	Heater Resistance outside of the expected range of	3.6 < ohms < 10.3	No Active DTC's Coolant – IAT Engine Soak Time Coolant Temp Ignition Voltage Engine Run time	ECT_Sensor_FA P262B IAT_SensorFA < 8.0 ºC > 28,800 seconds ≥ -30.0 ºC < 32.0 volts < 0.09 seconds	Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
MAP / MAF / Throttle Position Correlation	P0068	Detect when MAP and MAF do not match estimated engine airflow as established by the TPS	Difference between MAP and estimated MAP exceeds threshold (kPa), or P0651 (5 Volt Ref), or P0107 (MAP circuit low), or P0108 (MAP circuit high) have failed this key cycle, then MAP portion of diagnostic fails Absolute difference between MAF and estimated MAF exceed threshold (grams/sec), or P0102 (MAF circuit low), or P0103 (MAF circuit hi) have failed this key cycle, or maximum MAF versus RPM (Table) is greater than or equal to maximum MAF versus battery voltage, then MAF portion of diagnostic fails	Table, f(TPS). See supporting tables: **P0068_Delta MAP Threshold f(TPS)** Table, f(TPS). See supporting tables: **P0068_Delta MAF Threshold f(TPS)** Table, f(RPM). See supporting tables: **P0068_Maximum MAF f(RPM)** Table, f(Volts). See supporting tables: **P0068_Maximum MAF f(Volts)**	Engine Speed Run/Crank voltage	> 800 RPM > 6.41 Volts	Continuously fail MAP and MAF portions of diagnostic for 0.1875 s Continuous in MAIN processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Outside Air Temperature (OAT) Sensor Circuit Performance (OAT wired to ECM)	P0071	Detects an Outside Air Temperature (OAT) sensor that is stuck in range. There are two components to the test: an engine off component, and an engine running component. If the engine has been off for a long enough period of time, and the coolant temperature and Intake Air Temperature (IAT) values are similar, then the air temperature values in the engine compartment of the vehicle are considered to have equalized. In this case, the engine off component of the diagnostic can be enabled. If the IAT and the OAT values are similar, then the OAT Performance Diagnostic passes. If the IAT and OAT values are not similar, the diagnostic will continue to monitor the IAT and the OAT as the vehicle starts to move. For applications that have ability to move without engaging the	**<u>Engine Off:</u>** If IAT >= OAT: IAT - OAT If IAT < OAT: OAT - IAT If either of the following conditions are met, this diagnostic will pass: If IAT >= OAT: IAT - OAT If IAT < OAT: OAT - IAT	> 15.0 deg C > 15.0 deg C <= 15.0 deg C <= 15.0 deg C	Time between current ignition cycle and the last time the engine was running Engine is not running Vehicle Speed Coolant Temperature - IAT IAT - Coolant Temperature OAT-to-IAT engine off equilibrium counter The "OAT-to-IAT engine off equilibrium counter" is a counter that is incremented or decremented based on vehicle speed when the engine is off. When this counter is high enough, the vehicle has reached an equilibrium where IAT and OAT can be compared. The value that is added or subtracted to the counter every 100 msec is contained in table **P0071: OAT Performance Drive Equilibrium Engine Off** No Active DTCs:	>= 28,800.0 seconds >= 15.5 MPH < 15.0 deg C < 15.0 deg C >= 300.0 counts VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_DefaultDetected MAF_SensorFA	Executed every 100 msec until a pass or fail decision is made	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		internal combustion engine, the engine off test will continue. If the vehicle has been moving quickly enough for a long enough period of time, the IAT and OAT values should have reached an equilibrium. This period of time is defined by the "OAT-to-IAT engine off equilibrium counter". The "OAT-to-IAT engine off equilibrium counter" is a counter that is incremented or decremented based on vehicle speed when the engine is off. When this counter is high enough, the vehicle has reached an equilibrium where IAT and OAT can be compared. While the "OAT-to-IAT engine off equilibrium counter" is counting, IAT and OAT are monitored for similarity. If they are similar, the OAT Performance Diagnostic passes. If the counter reaches an equilibrium and the IAT and OAT values are not similar, the OAT Performance Diagnostic will fail.				EngineModeNotRunTimer Error		
			Engine Running: If IAT >= OAT: IAT - OAT If IAT < OAT: OAT - IAT If either of the following conditions are met, this diagnostic will pass: If IAT >= OAT: IAT - OAT If IAT < OAT: OAT - IAT	> 15.0 deg C > 15.0 deg C <= 15.0 deg C <= 15.0 deg C	Engine is running Vehicle Speed Engine air flow OAT-to-IAT engine running equilibrium counter The "OAT-to-IAT engine running equilibrium counter" is a counter that is incremented or decremented based on vehicle speed and engine air flow when the engine is running. When this counter is high enough, the vehicle has reached an equilibrium where IAT and OAT can be compared. The value that is added or subtracted to the counter every 100 msec is contained in table **P0071: OAT Performance Drive Equilibrium Engine Running** No Active DTCs:	>= 15.5 MPH >= 10.0 grams/second >= 300.0 counts VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_DefaultDetected MAF_SensorFA EngineModeNotRunTimer Error	Executed every 100 msec until a pass or fail decision is made	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		If the engine off component of the diagnostic did not make a pass or fail decision, the engine running component will begin executing when the internal combustion engine starts to run. If the vehicle has been moving quickly enough for a long enough period of time, the IAT and OAT values should have reached an equilibrium. This period of time is defined by the "OAT-to-IAT engine running equilibrium counter". The "OAT-to-IAT engine running equilibrium counter" is a counter that is incremented or decremented based on vehicle speed when the engine is running. When this counter is high enough, the vehicle has reached an equilibrium where IAT and OAT can be compared. While the "OAT-to-IAT engine running equilibrium counter" is counting, IAT and OAT are monitored for						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		similarity. If they are similar, the OAT Performance Diagnostic passes. If the counter reaches an equilibrium and the IAT and OAT values are not similar, the OAT Performance Diagnostic will fail.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Outside Air Temperature (OAT) Sensor Circuit Low	P0072	Detects a continuous short to ground in the Outside Air Temperature (OAT) signal circuit by monitoring the OAT sensor output resistance and failing the diagnostic when the OAT resistance is too low. The OAT sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A lower resistance is equivalent to a higher temperature.	Raw OAT Input	<= 52 Ohms (~150 deg C)	Continuous		40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Outside Air Temperature (OAT) Sensor Circuit High	P0073	Detects a continuous open circuit in the Outside Air Temperature (OAT) signal circuit by monitoring the OAT sensor output resistance and failing the diagnostic when the OAT resistance is too high. The OAT sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A higher resistance is equivalent to a lower temperature.	Raw OAT Input	>= 403,672 Ohms (~-60 deg C)	Continuous		40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Outside Air Temperature (OAT) Sensor Intermittent In-Range	P0074	Detects a noisy or erratic signal in the OAT circuit by monitoring the OAT sensor and failing the diagnostic when the OAT signal has a noisier output than is expected. When the value of the OAT signal in °C is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of OAT readings. The result of this summation is called a "string length". Since the OAT signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic OAT signal. The diagnostic will fail if the string length is too high.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current OAT reading - OAT reading from 100 milliseconds previous)	> 100 deg C 10 consecutive OAT readings		Continuous	4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module SIDI High Pressure Pump min/ max authority	P0089	This DTC determines when the high pressure pump control has reached to its max or min authority	High Pressure Fuel Pump Delivery Angle High Pressure Fuel Pump Delivery Angle	>= 240 ° Or <= 0 °	High Pressure Pump Performance Diagnostic Enable Battery Voltage Low Side Fuel Pressure Engine Run Time Barometric Pressure Inlet Air Temp Fuel Temp Additional Enable Conditions: All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) andCam or Crank Sensor Not FA and	True >= 11 Volts > 0.275 MPa >= **P0089 - P163A - P228C - P228D - P0191 - Engine run time threshold to Enable Diagnostic** (see supporting tables) Enabled when a code clear is not active or not exiting device control Engine is not cranking >= 70.0 KPA >= -10.0 degC -10 <= Temp degC <= 127	Windup High/ Low 10.00 seconds failures out of 12.50 Seconds samples	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is false and Device control pump ckt enabled on is false and Engine movement detected is true andManufacturers enable counter is 0) Flex Fuel Sensor Not FA Ignition voltage out of correlation error(P1682) not active			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Pressure Pump Control Solenoid Enable Low Side Open Circuit	P0090	Controller specific output driver circuit diagnoses High Pressure pump Control Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground	Engine Speed Battery Voltage	>= 50 RPM >= 11 Volts Not in pump device control Enabled when a code clear is not active or not exiting device control	20 failures out of 40 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Pressure Pump Control Solenoid Enable Low Side Short to Ground	P0091	Controller specific output driver circuit diagnoses High Pressure pump Control Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 0.1 Amps between signal and controller ground	Engine Speed Battery Voltage	>= 50 RPM >= 11 Volts Not in pump device control Enabled when a code clear is not active or not exiting device control	20 failures out of 40 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Pressure Pump Cntrl Solenoid Enable Low Side Short to Power	P0092	Controller specific output driver circuit diagnoses diagnoses High Pressure pump Control Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1.1 or 15 Amps selectable thershold based on High pressure Pump .	Engine Speed Battery Voltage	>= 50 RPM >= 11 Volts Not in pump device control Enabled when a code clear is not active or not exiting device control	20 failures out of 40 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 2 Circuit Performance (applications with humidity sensor, but no manifold temperature sensor)	P0096	Detects an Intake Air Temperature 2 (IAT2) sensor value that is stuck in range by comparing the IAT2 sensor value against the IAT and coolant temperature sensor values and failing the diagnostic if the IAT2 value is more different than the IAT and coolant temperature values than is expected. If the engine has been off for a long enough period of time, the air temperature values in the engine compartment of the vehicle are considered to have equalized, and the diagnostic can be enabled. The diagnostic will fail if the IAT and coolant temperature values are similar, and the IAT2 value is not similar to the IAT and coolant temperature values. This diagnostic is executed once per ignition cycle if the enable conditions are met.	ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up ECT – Power Up IAT2) >= ABS(Power Up ECT – Power Up IAT)	> 10 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit 2 Low (applications with humidity)	P0097	Detects a continuous short to ground in the Intake Air Temperature 2 (IAT2) signal circuit or an IAT2 sensor that is outputting a frequency signal that is too low. The diagnostic monitors the IAT2 sensor output frequency and fails the diagnostic when the IAT2 frequency is too low. The IAT2 sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. The temperature value is converted by the sensor to a frequency value in Hertz. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the frequency of the square wave signal and converts that frequency to a temperature value. A lower frequency is equivalent to a lower temperature. This diagnostic is enabled if the Powertrain Relay voltage is high enough.	Raw IAT 2 Input	< 13 Hertz (~-60 deg C)	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit 2 High (applications with humidity)	P0098	Detects an Intake Air Temperature 2 (IAT2) sensor that is outputting a frequency signal that is too high. The diagnostic monitors the IAT2 sensor output frequency and fails the diagnostic when the IAT2 frequency is too high. The IAT2 sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. The temperature value is converted by the sensor to a frequency value in Hertz. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the frequency of the square wave signal and converts that frequency to a temperature value. A higher frequency is equivalent to a higher temperature. This diagnostic is enabled if the Powertrain Relay voltage is high enough.	Raw IAT 2 Input	> 390 Hertz (~150 deg C)	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 2 Intermittent In-Range (applications with humidity)	P0099	Detects a noisy or erratic signal in the Intake Air Temperature 2 (IAT2) circuit by monitoring the IAT2 sensor and failing the diagnostic when the IAT2 signal has a noisier output than is expected. When the value of the IAT2 signal in °C is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of IAT2 readings. The result of this summation is called a “string length”. Since the IAT2 signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic IAT2 signal. The diagnostic will fail if the string length is too high. This diagnostic is if the Powertrain Relay voltage is high enough.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current IAT 2 reading - IAT 2 reading from 100 milliseconds previous)	> 100.00 deg C 10 consecutive IAT 2 readings	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Pressure Start Diagnostic	P00C6	The DTC Diagnoses the high side fuel pressure during engine cranking.	The ECM detects that the fuel pressure is not rising or has fallen beyond acceptable limits during engine cranking Pressure Rise Test: Sensed High Pressure Fuel Rail Pressure value Pressure Fall Test: Sensed High Pressure Fuel Rail Pressure value	< **P00C6 - Minimum pressure in MPa that will exit High Pressure Start mode and allow fuel delivery** (see Supporting Table) <= **P00C6 - Minimum acceptable value of fuel rail pressure after High Pressure Start** (see Supporting Table)	High Pressure Rise Diagnostic During Start High Pressure Fail Diagnostic During Start Low side feed fuel pressure Engine Run Time Run/Crank Voltage Engine Coolant For each engine start, only 1 diagnostic is performed. The pressure rise test will run if HIgh side fuel pressure is less than KtFHPC_p_HighPressStart, otherwise, the pressure fall diagnostic will run The pressure fall runs when the engine is cranking.	True False >= 0 KPA < = 0 sec > 8 Volts -100 <= °C <= 150 All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT, IAT2 and ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is	Pressure Rise Test: Crank Time >= **P00C6 - High Pressure Pump Control Mode timeout** (see Supporting Table) 6.25 ms per sample Pressure Fall Test: Injected cylinder events >= **P00C6 - maximum acceptable counts of fuel rail pressure below KtFHPD_p_HPS_PressFallLoThrsh after High Pressure Start** (see Supporting Table) 6 samples per engine rotation	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						false and Device control pump ckt enabled on is false and Engine movement detected is true and Manufacturers enable counter is 0) Flex Fuel Sensor Not FA Ignition voltage out of correlation error(P1682) not active		
					Barometric Pressure	>= 70.0 KPA		
					Inlet Air Temp	>= -10.0 DegC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Pressure Measurement System - Multiple Sensor Correlation (naturally aspirated with TIAP/ Baro sensor)	P00C7	Detects an inconsistency between pressure sensors in the induction system in which a particular sensor cannot be identified as the failed sensor. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Manifold Pressure (MAP) and Barometric Pressure (BARO) sensors values are checked to see if they are within the normal expected atmospheric pressure range. If they are, then MAP and BARO are compared to see if their values are similar. If the MAP and BARO values are not similar, there are no other pressure sensors to compare against to identify which sensor is not rational. The Multiple Pressure Sensor Correlation Diagnostic will fail in this case.	ABS(Manifold Pressure - Baro Pressure)	> 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating Manifold Pressure Manifold Pressure Baro Pressure Baro Pressure No Active DTCs: No Pending DTCs:	> 10.0 seconds >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa EngineModeNotRunTimer Error MAP_SensorFA AAP_SnsrFA MAP_SensorCircuitFP AAP_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Press Regulator Solenoid Supply Voltage Control High Side Circuit Open	P00C8	Controller specific output driver circuit diagnoses High Pressure pump Control Solenoid high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground	Engine Speed Battery Voltage	>= 50 RPM >= 11 Volts Not in pump device control Enabled when a code clear is not active or not exiting device control	20 failures out of 40 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Press Regulator Solenoid Supply Voltage Control High Side Circuit Short to ground	P00C9	Controller specific output driver circuit diagnoses High Pressure pump Control Solenoid high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 <= 1.1 or 15 Amps selectable thershold based on High pressure Pump.	Engine Speed Battery Voltage	>= 50 RPM >= 11 Volts Not in pump device control Enabled when a code clear is not active or not exiting device control	20 failures out of 40 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Press Regulator Solenoid Supply Voltage Control High Side Circuit Short to power	P00CA	Controller specific output driver circuit diagnoses High Pressure pump Control Solenoid high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 <= 0.1 Amps between signal and controller power	Engine Speed Battery Voltage	>= 50 RPM >= 11 Volts Not in pump device control Enabled when a code clear is not active or not exiting device control	20 failures out of 40 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Humidity Sensor Circuit Low	P00F4	Detects a continuous short to ground in the humidity signal circuit or a humidity sensor that is outputting a duty cycle that is too low. The diagnostic monitors the humidity sensor duty cycle output and fails the diagnostic when the humidity duty cycle is too low. The humidity sensor converts the capacitance across the sensor to a relative humidity. The relative humidity value is converted by the sensor to a duty cycle value in %. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the duty cycle of the square wave signal and converts that duty cycle to a relative humidity value in % through a transfer function. This diagnostic is enabled if the Powertrain Relay voltage is high enough.	Humidity Duty Cycle	<= 5.0 %	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Humidity Sensor Circuit High	P00F5	Detects a humidity sensor that is outputting a duty cycle signal that is too high. The diagnostic monitors the humidity sensor duty cycle output and fails the diagnostic when the humidity duty cycle is too high. The humidity sensor converts the capacitance across the sensor to a relative humidity. The relative humidity value is converted by the sensor to a duty cycle value in %. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the duty cycle of the square wave signal and converts that duty cycle to a relative humidity value in % through a transfer function. This diagnostic is enabled if the Powertrain Relay voltage is high enough.	Humidity Duty Cycle	>= 95.0 %	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Humidity Sensor Circuit Intermittent	P00F6	Detects a noisy or erratic signal in the humidity circuit by monitoring the humidity sensor and failing the diagnostic when the humidity signal has a noisier output than is expected. When the value of relative humidity in % is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of humidity readings. The result of this summation is called a “string length”. Since the humidity signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic humidity signal. The diagnostic will fail if the string length is too high. This diagnostic is enabled if the Powertrain Relay voltage is high enough.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current Humidity reading - Humidity reading from 100 milliseconds previous)	> 80 % 10 consecutive Humidity readings	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow System Performance (naturally aspirated)	P0101	Detects a performance failure in the Mass Air Flow (MAF) sensor, such as when a MAF value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAF sensor. In this case, the MAF Performance diagnostic will fail.	Filtered Throttle Model Error AND ABS(Measured Flow – Modeled Air Flow) Filtered AND ABS(Measured MAP – MAP Model 2) Filtered	<= 300 kPa*(g/s) > 14.0 grams/sec > 10.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 0 RPM <= 6,900 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM		
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow Sensor Circuit Low Frequency	P0102	Detects a continuous short to ground in the MAF sensor circuit or a MAF sensor that is outputting a frequency that is too low. The diagnostic monitors the MAF sensor frequency output and fails the diagnostic when the MAF frequency is too low. The MAF sensor monitors the temperature of a circuit in the air flow of the engine. The temperature of this circuit is related to the air velocity across the sensor. The MAF sensor converts this air velocity to a mass air flow value. The mass air flow value is converted by the sensor to a frequency value in Hertz. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the frequency of the square wave signal and converts that frequency to a mass air flow value in grams/second through a transfer function.	MAF Output	<= 800 Hertz (~ 0.59 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Above criteria present for a period of time	> 0.0 seconds >= 300 RPM >= 10.0 Volts >= 1.0 seconds	300 failures out of 375 samples 1 sample every cylinder firing event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow Sensor Circuit High Frequency	P0103	Detects a MAF sensor that is outputting a frequency signal that is too high. The diagnostic monitors the MAF sensor frequency output and fails the diagnostic when the MAF frequency is too high. The MAF sensor monitors the temperature of a circuit in the air flow of the engine. The temperature of this circuit is related to the air velocity across the sensor. The MAF sensor converts this air velocity to a mass air flow value. The mass air flow value is converted by the sensor to a frequency value in Hertz. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the frequency of the square wave signal and converts that frequency to a mass air flow value in grams/second through a transfer function.	MAF Output	>= 14,500 Hertz (~ 772.9 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Above criteria present for a period of time	> 0.0 seconds >= 300 RPM >= 10.0 Volts >= 1.0 seconds	300 failures out of 375 samples 1 sample every cylinder firing event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Performance (naturally aspirated)	P0106	Detects a performance failure in the Manifold Pressure (MAP) sensor, such as when a MAP value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The MAP sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the MAP performance diagnostic will fail. The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model	**<u>Engine Running:</u>** Filtered Throttle Model Error AND ABS(Measured MAP – MAP Model 1) Filtered AND ABS(Measured MAP – MAP Model 2) Filtered	<= 300 kPa*(g/s) > 20.0 kPa > 10.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. No Active DTCs:	>= 0 RPM <= 6,900 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA	Continuous Calculations are performed every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAP sensor. In this case, the MAP Performance diagnostic will fail.			No Pending DTCs:	ECT_Sensor_FA IAT_SensorFA EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP		
			<u>Engine Not Rotating:</u> Manifold Pressure OR Manifold Pressure	< 50.0 kPa > 115.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Circuit Low (Gen III)	P0107	Detects a continuous short to ground in the Manifold Absolute Pressure (MAP) signal circuit by monitoring the MAP sensor output voltage and failing the diagnostic when the MAP voltage is too low. The MAP sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	MAP Voltage	< 3.0 % of 5 Volt Range (This is equal to 6.1 kPa)	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Circuit High (Gen III)	P0108	Detects a continuous short to power or open circuit in the Manifold Absolute Pressure (MAP) signal circuit by monitoring the MAP sensor output voltage and failing the diagnostic when the MAP voltage is too high. The MAP sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	MAP Voltage	> 90.0 % of 5 Volt Range (This is equal to 115.1 kPa)	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit Performance (applications with humidity sensor, but no manifold temperature sensor)	P0111	Detects an Intake Air Temperature (IAT) sensor value that is stuck in range by comparing the IAT sensor value against the IAT2 and coolant temperature sensor values and failing the diagnostic if the IAT value is more different than the IAT2 and coolant temperature values than is expected. If the engine has been off for a long enough period of time, the air temperature values in the engine compartment of the vehicle are considered to have equalized, and the diagnostic can be enabled. The diagnostic will fail if the IAT2 and coolant temperature values are similar, and the IAT value is not similar to the IAT2 and coolant temperature values. This diagnostic is executed once per ignition cycle if the enable conditions are met.	ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up ECT – Power Up IAT) > ABS(Power Up ECT – Power Up IAT2)	> 10 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit Low	P0112	Detects a continuous short to ground in the Intake Air Temperature (IAT) signal circuit by monitoring the IAT sensor output resistance and failing the diagnostic when the IAT resistance is too low. The IAT sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A lower resistance is equivalent to a higher temperature.	Raw IAT Input	< 58.00 Ohms (~150 deg C)	Engine Run Time	> 0.00 seconds	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit High	P0113	Detects a continuous open circuit in the Intake Air Temperature (IAT) signal circuit by monitoring the IAT sensor output resistance and failing the diagnostic when the IAT resistance is too high. The IAT sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A higher resistance is equivalent to a lower temperature.	Raw IAT Input	> 142,438 Ohms (~-60 deg C)	Engine Run Time	> 0.00 seconds	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Intermittent In-Range	P0114	Detects a noisy or erratic signal in the Intake Air Temperature (IAT) circuit by monitoring the IAT sensor and failing the diagnostic when the IAT signal has a noisier output than is expected. When the value of the IAT signal in °C is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of IAT readings. The result of this summation is called a “string length”. Since the IAT signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic IAT signal. The diagnostic will fail if the string length is too high.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current IAT reading - IAT reading from 100 milliseconds previous)	> 80.00 deg C 10 consecutive IAT readings	Continuous		4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temp Sensor Circuit Low	P0117	Circuit Continuity This DTC detects a short to ground in the ECT (Engine Coolant temperature) signal circuit or the ECT sensor. This is accomplished by monitoring the resistance of the circuit. If the resistance goes out of the expected range the DTC is set.	ECT Resistance (@ 150ºC)	< 45 Ohms			5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temp Sensor Circuit High	P0118	Circuit Continuity This DTC detects a short to high or open in the ECT (Engine Coolant temperature) signal circuit or the ECT sensor. This is accomplished by monitoring the resistance of the circuit. If the resistance goes out of the expected range the DTC is set.	ECT Resistance (@ -60ºC)	> 400,000 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -7.0 °C	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature (ECT) Sensor Circuit Intermittent	P0119	Circuit Erratic This DTC detects large step changes in the ECT (Engine Coolant temperature) signal circuit or the ECT sensor. Allowable high and low limits are calculated for the next sample based on the previous sample and sensor time constant. If the sensor responds faster than should be possible the DTC is set.	ECT temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. The calculated high and low limits for the next reading use the following calibrations: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last ECT reading was 90 Deg C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 Deg C and the high limit was calibrated to 200 Deg C the caluculated limits are 101 Deg C and 73 Deg C. The next reading (after the 90 Deg C reading) must be between 73 Deg C and 101 Deg C to be valid.	13.0 seconds -60.0 Deg C 150.0 Deg C	No Active DTC's	ECT_Sensor_Ckt_FP	3 failures out of 4 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			*****************************					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Sensor Performance (naturally aspirated)	P0121	Detects a performance failure in the Throttle Position sensor (TPS) sensor, such as when a TPS value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor and Mass Air Flow (MAF) sensor. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the TPS sensor. In this case, the TPS Performance diagnostic will fail.	Filtered Throttle Model Error AND ABS(Measured MAP – MAP Model 2) Filtered	> 300 kPa*(g/s) <= 10.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. No Active DTCs: No Pending DTCs:	>= 0 RPM <= 6,900 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS1 Circuit Low	P0122	Detects a continuous or intermittent short low or open in TPS1 circuit by monitoring the TPS 1 sensor percent Vref and failing the diagnostic when the TPS percent Vref is too low. This diagnostic only runs when battery voltage is high enough.	TPS1 % Vref <	0.3250 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P06A3	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS1 Circuit High	P0123	Detects a continuous or intermittent short high in TPS1 circuit by monitoring the TPS 1 sensor percent Vref and failing the diagnostic when the TPS percent Vref is too high. This diagnostic only runs when battery voltage is high enough.	TPS1 % Vref >	4.750 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P06A3	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Below Stat Regulating Temperature	P0128	This DTC detects if the ECT (EngineCoolant temperature) does not achieve the required target temperature after an allowed energy accumulation by the engine. This can be caused by an ECT sensor biased low or a cooling system that is not warming up correctly because of a stuck open thermostat or other fault.	Energy is accumulated after the first conbustion event using Range #1 or #2 below: Thermostat type is divided into normal (non-heated) and electrically heated. For this application the "type" cal (KeTHMG_b_TMS_ElecThstEquipped) = 0 If the type cal is equal to one, the application has an electrically heated t-stat, if equal to zero the the application has an non heated t-stat. See appropiate section below. **************************** Type cal above = 1 (Electrically heated t-stat) == == == == Range #1 (Primary) ECT reaches Commanded temperature minus 11 °C when Ambient min is ≤ 52 °C and > 10 °C. Note: Warm up target for range #1 will be at least 80 °C == == == == Range #2 (Alternate) ECT reaches Commanded temperature minus 31 °C when Ambient min is ≤ 10 °C and > -7 °C. Note: Warm up target for range #2 will be at least	See the two tables named: **P0128_Maximum Accumulated Energy for Start-up ECT conditions - Primary** and **P0128_Maximum Accumulated Energy for Start-up ECT conditions - Alternate** in the Supporting tables section. This diagnostic models the net energy into and out of the cooling	No Active DTC's Engine not run time (soaking time before current trip) Engine run time Fuel Condition Distance traveled *************************** If Engine RPM is continuously greater than for this time period The diagnostic test for this key cycle will abort *************************** *************************** If T-Stat Heater commanded duty cycle for this time period	ECT_Sensor_Ckt_FA ECT_Sensor_Perf_FA VehicleSpeedSensor_FA OAT_PtEstFiltFA IAT_SensorCircuitFA MAF_SensorFA THMR_AWP_AuxPumpFA THMR_AHV_FA THMR_SWP_Control_FA THMR_SWP_NoFlow_FA THMR_SWP_FlowStuckOn_FA EngineTorqueEstInaccurate ≥ 1,800 seconds 30 ≤ Eng Run Tme ≤ 1,450 seconds Ethanol ≤ 87 % ≥ 1.49 miles *************************** 9,999 rpm 5.0 seconds *************************** *************************** > 20.0 % duty cycle > 5.0 seconds	1 failure to set DTC 1 sec/ sample Once per ignition key cycle	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			55 °C ***************************** Type cal above = 0 (non - heated t-stat) == == == == Range #1 (Primary) ECT reaches 80 °C when Ambient min is ≤ 52 °C and > 10 °C. == == == == Range #2 (Alternate) ECT reaches 55 °C when Ambient min is ≤ 10 °C and > -7 °C. *****************************	system during the warm-up process. The five energy terms are: heat from combustion (with AFM correction), heat from after-run, heat loss to enviroment, heat loss to cabin and heat loss to DFCO.	The diagnostic test for this key cycle will abort *************************** ECT at start run	 *************************** -60 ≤ ECT ≤ 75 °C		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 1 Sensor 1	P0131	This DTC determines if the O2 sensor signal circuit is shorted low. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is below the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	< 40.0 mVolts	No Active DTC's	TPS_ThrottleAuthorityDefaulted MAP_SensorFA AIR System FA Ethanol Composition Sensor FA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA	320 failures out of 400 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips
					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	= Not active = Not active = Not active = Not active 10.0 < Volts = Not active = Not active = Not active = Not active		
					Low Fuel Condition Only when FuelLevelDataFault	= False = False		
					Commanded Equivalence Ratio Air Per Cylinder Fuel Control State Closed Loop Active	0.9805 < ratio < 1.0996 50 < mgram < 500 = Closed Loop = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables).		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					All Fuel Injectors for active Cylinders Fuel Condition Ethanol Fuel State All of the above met for	Enabled (On) Ethanol ≤ 87 % not in estimate mode DFCO not active > 5.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 1 Sensor 1	P0132	This DTC determines if the O2 sensor signal circuit is shorted high or open. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is above the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	> 1,050 mvolts	No Active DTC's System Voltage AFM Status Heater Warm-up delay Engine Run Time Engine Run Accum Low Fuel Condition Diag Only when FuelLevelDataFault *********************** Secondary delay after above conditions are complete (cold start condition) Secondary delay after above conditions are complete (not cold start condition) Commanded Equivalence Ratio *********************** All of the above met for	TPS_ThrottleAuthorityDefaulted MAF_SensorFA MAP_SensorFA EvapExcessPurgePsbl_FA FuelInjectorCircuit_FA Ethanol Composition Sensor FA AIR System FA 10.0 < Volts = All Cylinders active = Complete > 5.0 seconds > 30.0 seconds = False = False *********************** > 150.0 seconds when engine soak time > 28,800 seconds > 150.0 seconds when engine soak time ≤ 28,800 seconds ≤ 1.100 EQR *********************** > 3.0 seconds	70 failures out of 88 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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. This test compares the measured heater current (monitored thru the low side driver) and compares it to the expected values (over the voltage range provided) for the released sensor. The diagnostic failure counter is incremented if the heater current is outside the expected range. This DTC is set based on the fail and sample counters.	Heater Current outside of the expected range of	0.4 < Amps < 4.3	No Active DTC's System Voltage Heater Warm-up delay O2S Heater device control B1S1 O2S Heater Duty Cycle All of the above met for	ECT_Sensor_FA > 10.0 Volts = Complete = Not active > zero > 120 seconds	8 failures out of 10 samples Frequency: 2 tests per trip 10 seconds delay between tests and 1 second execution rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 1 Sensor 2) (For Dual Bank Exhaust Only	P0137	This DTC determines if the O2 sensor signal circuit is shorted low. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is below the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	< 50 mvolts	No Active DTC's 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 Only when FuelLevelDataFault Commanded Equivalence Ratio Air Per Cylinder Fuel Control State Closed Loop Active	TPS_ThrottleAuthorityDefaulted MAP_SensorFA AIR System FA Ethanol Composition Sensor FA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA = Not active = Not active = Not active = Not active 10.0 < Volts = Not active = Not active = Not active = Not active = False = False 0.980 ≤ ratio ≤ 1.100 50 ≤ mgrams ≤ 500 = Closed Loop = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables).	320 failures out of 400 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					All Fuel Injectors for active Cylinders Fuel Condition Ethanol Fuel State All of the above met for	Enabled (On) Ethanol ≤ 87 % not in estimate mode DFCO not active > 5.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 1 Sensor 2) (For Dual Bank Exhaust Only	P0138	This DTC determines if the O2 sensor signal circuit is shorted high or open. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is above the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	> 1,050 mvolts	No Active DTC's System Voltage AFM Status Heater Warm-up delay Engine Run Time Engine Run Accum Low Fuel Condition Only when FuelLevelDataFault ********************** Secondary delay after above conditions are complete (cold start condition) Secondary delay after above conditions are complete (not cold start condition) Commanded Equivalence Ratio ********************** All of the above met for	TPS_ThrottleAuthorityDefaulted MAF_SensorFA MAP_SensorFA EvapExcessPurgePsbl_FA FuelInjectorCircuit_FA Ethanol Composition Sensor FA AIR System FA 10.0 < Volts = All Cylinders active = Complete > 5.0 seconds > 30.0 seconds = False = False ********************** > 150.0 seconds when engine soak time > 28,800 seconds > 150.0 seconds when engine soak time ≤ 28,800 seconds ≤ 1.100 EQR ********************** > 3.0 seconds	100 failures out of 125 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Slow Response Rich to Lean Bank 1 Sensor 2	P013A	The P013A diagnostic is the third in a sequence of six intrusive secondary O2 monitors which include DTCs P2270, P013E, P013A, P2271, P013F, & P013B. This DTC determines if the secondary O2 sensor has an slow response to an A/F change from Rich to Lean and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic commands fuel cut off while monitoring the sensor signal and the accumulated mass air flow. Note: The Primary method is used when the secondary O2 sensor signal transitions from above the upper threshold to below the lower threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P013A diagnostic measures the secondary O2 sensor voltage response rate	Primary Method: The EWMA of the Post O2 sensor normalized integral value. The EWMA calculation uses a 0.35 coefficient. OR Secondary Method: The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds)	> 9.0 units > 20.0 grams (upper voltage threshold is 450 mvolts and lower voltage threshold is 150 mvolts)	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013B, P013E, P013F, P2270 or P2271 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec.	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between an upper and lower voltage threshold. The response rate is then normalized to mass air flow rate and scaled resulting in a normalized intregral value. The normalized integral is fed into a 1st order lag filter to update the final EWMA result. DTC P013A is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller’s non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method:			Low Fuel Condition Only when FuelLevelDataFault Post fuel cell Crankshaft Torque DTC's Passed =================== After above conditions are met: DFCO mode is continued (wo driver initiated pedal input).	= False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. < 100.0 Nm P2270 (and P2272 if applicable) P013E (and P014A if applicable) ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		This fault is set if the secondary O2 sensor does not achieve the required lower voltage threshold before the accumulated mass air flow threshold is reached.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Slow Response Lean to Rich Bank 1 Sensor 2	P013B	The P013B diagnostic is the sixth in a sequence of six intrusive secondary O2 monitors which include DTCs P2270, P013E, P013A, P2271, P013F, & P013B. This DTC determines if the secondary O2 sensor has an slow response to an A/F change from Lean to Rich and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic increases the delivered fuel while monitoring the sensor signal and the accumulated mass air flow. Note: The Primary method is used when the secondary O2 sensor signal transitions from below the lower threshold to above the upper threshold, otherwise the Secondary method is used. Primary method: The P013B diagnostic measures the secondary O2 sensor voltage response rate	Primary Method: The EWMA of the Post O2 sensor normalized integral value. The EWMA calculation uses a 0.35 coefficient. OR Secondary Method: The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds)	> 7.0 units > 75 grams (lower voltage threshold is 350 mvolts and upper voltage threshold is 600 mvolts)	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013A, P013E, P013F, P2270 or P2271 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between an lower and upper voltage threshold. The response rate is then normalized to mass air flow rate and scaled resulting in a normalized intregral value. The normalized integral is fed into a 1st order lag filter to update the final EWMA result. DTC P013B is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method:			 Green Cat System Condition Low Fuel Condition Only when FuelLevelDataFault Post fuel cell DTC's Passed =================== After above conditions are met: Fuel Enrich mode continued. =================	is above 22.0 grams/sec. = Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 720,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 22.0 grams/sec. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service). = False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. P2270 P013E P013A P2271 P013F ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		This fault is set if the secondary O2 sensor does not achieve the required upper voltage threshold before the accumulated mass air flow threshold is reached.			During this test the following must stay TRUE or the test will abort: 0.960 ≤ Fuel EQR ≤ 1.080			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Slow Response Rich to Lean Bank 2 Sensor 2	P013C	The P013C diagnostic is the third in a sequence of six intrusive secondary O2 monitors which include DTCs P2272, P014A, P013C, P2273, P014B, & P013D. This DTC determines if the secondary O2 sensor has an slow response to an A/F change from Rich to Lean and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic commands fuel cut off while monitoring the sensor signal and the accumulated mass air flow. Note: The Primary method is used when the secondary O2 sensor signal transitions from above the upper threshold to below the lower threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P013C diagnostic measures the secondary O2 sensor voltage response rate	Primary Method: The EWMA of the Post O2 sensor normalized integral value.The EWMA calculation uses a 0.35 coefficient. OR Secondary Method: The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds)	> 9.0 units > 20.0 grams (upper voltage threshold is 450 mvolts and lower voltage threshold is 150 mvolts)	No Active DTC's B2S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013D, P014A, P014B, P2272 or P2273 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between an upper and lower voltage threshold. The response rate is then normalized to mass air flow rate and scaled resulting in a normalized intregral value. The normalized integral is fed into a 1st order lag filter to update the final EWMA result. DTC P013C is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method:			 Low Fuel Condition Only when FuelLevelDataFault Post fuel cell Crankshaft Torque DTC's Passed ================== After above conditions are met: DFCO mode is continued (wo driver initiated pedal input).	is above 22.0 grams/sec. = False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. < 100.0 Nm P2272 P014A ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		This fault is set if the secondary O2 sensor does not achieve the required lower voltage threshold before the accumulated mass air flow threshold is reached.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Slow Response Lean to Rich Bank 2 Sensor 2	P013D	The P013D diagnostic is the sixth in a sequence of six intrusive secondary O2 monitors which include DTCs P2272, P014A, P013C, P2273, P014B, & P013D. This DTC determines if the secondary O2 sensor has an slow response to an A/F change from Lean to Rich and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic increases the delivered fuel while monitoring the sensor signal and the accumulated mass air flow. Note: The Primary method is used when the secondary O2 sensor signal transitions from below the lower threshold to above the upper threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P013D diagnostic measures the secondary O2 sensor voltage response rate	Primary Method: The EWMA of the Post O2 sensor normalized integral value. The EWMA calculation uses a 0.35 coefficient. OR Secondary Method: The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds)	> 7.0 units > 75 grams (lower voltage threshold is 350 mvolts and upper voltage threshold is 600 mvolts)	No Active DTC's B2S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013C, P014A, P014B, P2272 or P2273 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between an lower and upper voltage threshold. The response rate is then normalized to mass air flow rate and scaled resulting in a normalized intregral value. The normalized integral is fed into a 1st order lag filter to update the final EWMA result. DTC P013D is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method:			 Green Cat System Condition Low Fuel Condition Only when FuelLevelDataFault Post fuel cell DTC's Passed =================== After above conditions are met: Fuel Enrich mode continued. ================= During this test the	is above 22.0 grams/sec. = Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 720,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 22.0 grams/ sec. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service). = False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. P2272 P014A P013C P2273 P014B ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		This fault is set if the secondary O2 sensor does not achieve the required upper voltage threshold before the accumulated mass air flow threshold is reached.			following must stay TRUE or the test will abort: 0.960 ≤ Fuel EQR ≤ 1.080			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Rich to Lean Bank 1 Sensor 2	P013E	The P013E diagnostic is the second in a sequence of six intrusive secondary O2 monitors which include DTCs P2270, P013E, P013A, P2271, P013F, & P013B. This DTC determines if the secondary O2 sensor has an initial delayed response to an A/F change from Rich to Lean and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic commands fuel cut off while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor voltage AND The Accumulated mass air flow monitored during the Delayed Response Test under DFCO DFCO begins after: 1) Catalyst has been rich for a minimum of AND 2) Catalyst Rich Accumulation Air Flow is	> 450 mvolts > 40 grams > 2 secs ≥ 3 grams	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013A, P013B, P013F, P2270 or P2271 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					Crankshaft Torque	< 100.0 Nm		
					DTC's Passed	P2270		
					Number of fueled cylinders	≤ 5 cylinders		
					===================	==================		
					After above conditions are met: DFCO mode entered (wo driver initiated pedal input).			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 2	P013F	The P013F diagnostic is the fifth in a sequence of six intrusive secondary O2 monitors which include DTCs P2270, P013E, P013A, P2271, P013F, & P013B. This DTC determines if the secondary O2 sensor has an initial delayed response to an A/F change from Lean to Rich and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic increases the delivered fuel while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor voltage AND The Accumulated mass air flow monitored during the Delayed Response Test	< 350 mvolts > 150 grams	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013A, P013B, P013E, P2270 or P2271 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Green Cat System Condition	= Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 720,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 22.0 grams/ sec. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service).		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					DTC's Passed	P2270 P013E P013A P2271		
					Number of fueled cylinders	≥ 1 cylinders		
					===================	==================		
					After above conditions are met: Fuel Enrich mode entered.			
					=================			
					During this test the			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					following must stay TRUE or the test will abort: 0.960 ≤ Fuel EQR ≤ 1.080			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Performance Bank 1 Sensor 2) (For Dual Bank Exhaust Only	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. This test compares the measured heater current (monitored thru the low side driver) and compares it to the expected values (over the voltage range provided) for the released sensor. The diagnostic failure counter is incremented if the heater current is outside the expected range. This DTC is set based on the fail and sample counters.	Heater Current outside of the expected range of	0.4 > amps > 4.3	No Active DTC's System Voltage Heater Warm-up delay O2S Heater device control B1S1 O2S Heater Duty Cycle All of the above met for	ECT_Sensor_FA > 10.0 Volts = Complete = Not active > zero > 120 seconds	8 failures out of 10 samples Frequency: 2 tests per trip 10 seconds delay between tests and 1 second execution rate.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Rich to Lean Bank 2 Sensor 2	P014A	The P014A diagnostic is the second in a sequence of six intrusive secondary O2 monitors which include DTCs P2272, P014A, P013C, P2273, P014B, & P013D. This DTC determines if the secondary O2 sensor has an initial delayed response to an A/F change from Rich to Lean and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic commands fuel cut off while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor voltage AND The Accumulated mass air flow monitored during the Delayed Response Test under DFCO DFCO begins after: 1) Catalyst has been rich for a minimum of AND 2) Catalyst Rich Accumulation Air Flow is	> 450 mvolts > 40 grams > 2 secs ≥ 3 grams	No Active DTC's B2S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013C, P013D, P014B, P2272 or P2273 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					Crankshaft Torque	< 100.0 Nm		
					DTC's Passed	P2272		
					Number of fueled cylinders	≤ 5 cylinders		
					==================	==================		
					After above conditions are met: DFCO mode entered (wo driver initiated pedal input).			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 2 Sensor 2	P014B	The P014B diagnostic is the fifth in a sequence of six intrusive secondary O2 monitors which include DTCs P2272, P014A, P013C, P2273, P014B, & P013D. This DTC determines if the secondary O2 sensor has an initial delayed response to an A/F change from Lean to Rich and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic increases the delivered fuel while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor AND The Accumulated mass air flow monitored during the Delayed Response Test	< 350 mvolts > 150 grams.	No Active DTC's B2S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013C, P013D, P014A, P2272 or P2273 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Green Cat System Condition	= Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 720,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 22.0 grams/ sec. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service).		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					DTC's Passed	P2272 P014A P013C P2273		
					Number of fueled cylinders	≥ 1 cylinders		
					=================== After above conditions are met: Fuel Enrich mode entered. ================= During this test the	==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					following must stay TRUE or the test will abort: 0.960 ≤ Fuel EQR ≤ 1.080			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 2 Sensor 1	P0151	This DTC determines if the O2 sensor signal circuit is shorted low. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is below the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	< 40 mvolts	No Active DTC's	TPS_ThrottleAuthorityDefaulted MAP_SensorFA AIR System FA Ethanol Composition Sensor FA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA	320 failures out of 400 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips
					AIR intrusive test	= Not active		
					Fuel intrusive test	= Not active		
					Idle intrusive test	= Not active		
					EGR intrusive test	= Not active		
					System Voltage	10.0 < Volts		
					EGR Device Control	= Not active		
					Idle Device Control	= Not active		
					Fuel Device Control	= Not active		
					AIR Device Control	= Not active		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Commanded Equivalence Ratio	0.980 ≤ ratio ≤ 1.100		
					Air Per Cylinder	50 ≤ APC ≤ 500 mgrams		
					Fuel Control State	= Closed Loop		
					Closed Loop Active	= TRUE (Please see “**Closed Loop Enable Clarification**” in		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Supporting Tables).		
					All Fuel Injectors for active Cylinders	Enabled (On)		
					Fuel Condition	≤ 87 % Ethanol		
					Ethanol	not in estimate mode		
					Fuel State	DFCO not active		
					All of the above met for	> 5.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 2 Sensor 1	P0152	This DTC determines if the O2 sensor signal circuit is shorted high or open. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is above the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	> 1,050 mvolts	No Active DTC's System Voltage AFM Status Heater Warm-up delay Engine Run Time Engine Run Accum Low Fuel Condition Only when FuelLevelDataFault *********************** Secondary delay after above conditions are complete (cold start condition) Secondary delay after above conditions are complete (not cold start condition) Commanded Equivalence Ratio *********************** All of the above met for	TPS_ThrottleAuthorityDefaulted MAF_SensorFA MAP_SensorFA EvapExcessPurgePsbl_FA FuelInjectorCircuit_FA Ethanol Composition Sensor FA AIR System FA 10.0 < Volts = All Cylinders active = Complete > 5.0 seconds > 30.0 seconds = False = False *********************** > 210.0 seconds when engine soak time > 28,800 seconds > 210.0 seconds when engine soak time ≤ 28,800 seconds ≤ 1.100 EQR *********************** > 3 seconds	70 failures out of 88 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Performance Bank 2 Sensor 1	P0155	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. This test compares the measured heater current (monitored thru the low side driver) and compares it to the expected values (over the voltage range provided) for the released sensor. The diagnostic failure counter is incremented if the heater current is outside the expected range. This DTC is set based on the fail and sample counters.	Heater Current outside of the expected range of	0.4 > amps > 4.3	No Active DTC's System Voltage Heater Warm-up delay O2S Heater device control B1S1 O2S Heater Duty Cycle All of the above met for	ECT_Sensor_FA > 10.0 Volts = Complete = Not active > zero > 120 seconds	8 failures out of 10 samples Frequency: 2 tests per trip 10 seconds delay between tests and 1 second execution rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 2 Sensor 2	P0157	This DTC determines if the O2 sensor signal circuit is shorted low. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is below the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	< 50 mvolts	No Active DTC's	TPS_ThrottleAuthorityDefaulted MAP_SensorFA AIR System FA Ethanol Composition Sensor FA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA	320 failures out of 400 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips
					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	= Not active = Not active = Not active = Not active 10.0 < Volts = Not active = Not active = Not active = Not active		
					Low Fuel Condition Only when FuelLevelDataFault	= False = False		
					Commanded Equivalence Ratio Air Per Cylinder Fuel Control State Closed Loop Active	0.980 ≤ ratio ≤ 1.100 50 ≤ mgrams ≤ 500 = Closed Loop = TRUE (Please see “**Closed Loop Enable Clarification**” in Supporting Tables).		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					All Fuel Injectors for active Cylinders Fuel Condition Ethanol Fuel State All of the above met for	Enabled (On) ≤ 87 % Ethanol not in estimate mode DFCO not active > 5.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 2 Sensor 2	P0158	This DTC determines if the O2 sensor signal circuit is shorted high or open. When enabled, the diagnostic monitors the O2S signal and compares it to the threshold. The diagnostic failure counter is incremented if the O2S signal is above the threshold value. This DTC is set based on the fail and sample counters.	Oxygen Sensor Signal	> 1,050 mvolts	No Active DTC's System Voltage AFM Status Heater Warm-up delay Engine Run Time Engine Run Accum Low Fuel Condition Only when FuelLevelDataFault *********************** Secondary delay after above conditions are complete (cold start condition) Secondary delay after above conditions are complete (not cold start condition) Commanded Equivalence Ratio *********************** All of the above met for	TPS_ThrottleAuthorityDefaulted MAF_SensorFA MAP_SensorFA EvapExcessPurgePsbl_FA FuelInjectorCircuit_FA Ethanol Composition Sensor FA AIR System FA 10.0 < Volts = All Cylinders active = Complete > 5.0 seconds > 30.0 seconds = False = False *********************** > 210.0 seconds when engine soak time > 28,800 seconds > 210.0 seconds when engine soak time ≤ 28,800 seconds ≤ 1.100 EQR *********************** > 3 seconds	100 failures out of 125 samples Frequency: Continuous in 100 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Rich to Lean Bank 1 Sensor 1) (For use w/o WRAF	P015A	DTC P015A detects that the primary oxygen sensor for Bank 1 has delayed response when the air fuel ratio transitions from rich to lean condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor rich to lean tests (P013E / P013A / P2271), which commands fuel cut off. Note: The Primary method is used when the primary O2 sensor signal transitions from above to below the O2 voltage threshold, otherwise the Secondary method is used. Primary method: The P015A diagnostic measures the primary O2 sensor response time between a rich condition above a starting voltage threshold and a lower voltage threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in a normalized delay	Primary Method: The EWMA of the Pre O2 sensor normalized R2L time delay value. The EWMA calculation uses a 0.25 coefficient. OR Secondary Method: The Accumulated time monitored during the R2L Delayed Response Test. AND Pre O2 sensor voltage is	> 0.6 EWMA (sec) ≥ 2.0 Seconds >450 mvolts	No Active DTC's System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault Green O2S Condition	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0131, P0132, P013A, P013B, P013E, P013F, P2270, P2271 > 10.0 Volts = Not active = Not active = Not active = Not active = False = False = Not Valid, Green O2S condition is	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015A is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method: This fault is set if the primary O2 sensor does not achieve the required lower voltage threshold before a delay time threshold is reached.			O2 Heater (pre sensor) on for Learned Htr resistance Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral	considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 60 seconds = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") > 50 ºC = TRUE) > -40 ºC > 30 seconds 850 ≤ RPM ≤ 2,500 800 ≤ RPM ≤ 2,550 4.0 ≤ gps ≤ 11.5 42.3 ≤ MPH ≤ 80.2 38.5 ≤ MPH ≤ 82.0 0.87 ≤ C/L Int ≤ 1.07		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Closed Loop Active	= TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables).		
					Evap	not in control of purge		
					Ethanol	not in estimate mode		
					Baro	> 70 kpa		
					Post fuel cell	= enabled		
					EGR Intrusive diagnostic	= not active		
					All post sensor heater delays	= not active		
					O2S Heater (post sensor) on Time	≥ 60.0 sec		
					Predicted Catalyst temp	575 ≤ ºC ≤ 980		
					Fuel State	= DFCO possible		
					===================	==================		
					All of the above met for at least 2.0 seconds, and then the Force Cat Rich intrusive stage is requested.			
					===================	==================		
					Pre O2S voltage B1S1 at end of Cat Rich stage	≥ 710 mvolts		
					Fuel State	= DFCO active		
					Number of fueled cylinders	≤ 5 cylinders		
					===================	==================		
					After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input).			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 1) (For use w/o WRAF	P015B	DTC P015B detects that the primary oxygen sensor for Bank 1 has delayed response when the air fuel ratio transitions from lean to rich condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor lean to rich tests (P013F / P013B), which commands fuel enrichment. Note: The Primary method is used when the primary O2 sensor signal transitions from lean condition to above the O2 voltage threshold, otherwise the Secondary method is used. Primary method: The P015B diagnostic measures the primary O2 sensor response time between a lean condition and a higher voltage threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in a normalized delay value. The normalized delay is fed into a 1st	Primary method: The EWMA of the Pre O2 sensor normalized L2R time delay value. The EWMA calculation uses a 0.25 coefficient. OR Secondary method: The Accumulated time monitored during the L2R Delayed Response Test. AND Pre O2 sensor voltage is OR At end of Cat Rich stage the Pre O2 sensor output is	> 0.8 EWMA (sec) ≥ 2.0 Seconds < 450 mvolts < 710 mvolts	No Active DTC's P015A test is complete and System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0131, P0132, P013A, P013B, P013E, P013F, P015A, P2270, P2271 = Passed > 10.0 Volts = Not active = Not active = Not active = Not active = False = False	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		order lag filter to update the final EWMA result. DTC P015B is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary O2 sensor does not achieve the required higher voltage threshold before a delay time threshold is reached.			Green O2S Condition	= Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec.		
					O2 Heater (pre sensor) on for	≥ 60 seconds		
					Learned Htr resistance	= Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's")		
					Engine Coolant (Or OBD Coolant Enable Criteria	> 50 ºC = TRUE)		
					IAT	> -40 ºC		
					Engine run Accum	> 30 seconds		
					Engine Speed to initially enable test	850 ≤ RPM ≤ 2,500		
					Engine Speed range to keep test enabled (after initially enabled)	800 ≤ RPM ≤ 2,550		
					Engine Airflow	4.0 ≤ gps ≤ 11.5		
					Vehicle Speed to initially enable test	42.3 ≤ MPH ≤ 80.2		
					Vehicle Speed range to keep test enabled (after			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					initially enabled) Closed loop integral Closed Loop Active Evap Ethanol Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on Time Predicted Catalyst temp Fuel State Number of fueled cylinders ================ When above conditions are met: Fuel Enrich mode is entered. ================ During this test: Engine Airflow must stay between: and the delta Engine Airflow over 12.5msec must be :	38.5 ≤ MPH ≤ 82.0 0.87 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables). not in control of purge not in estimate mode > 70 kpa = enabled = not active = not active ≥ 60.0 sec 575 ≤ ºC ≤ 980 = DFCO inhibit ≥ 1 cylinders ================== ================== 0 ≤ gps ≤ 11 ≤ 2.0 gps		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Rich to Lean Bank 2 Sensor 1) (For use w/o WRAF	P015C	DTC P015C detects that the primary oxygen sensor for Bank 2 has delayed response when the air fuel ratio transitions from rich to lean condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor rich to lean tests (P014A / P013C / P2273), which commands fuel cut off. Note: The Primary method is used when the primary O2 sensor signal transitions from above to below the O2 voltage threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P015C diagnostic measures the primary O2 sensor response time between a rich condition above a starting voltage threshold and a lower voltage threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in a normalized delay	Primary method: The EWMA of the Pre O2 sensor normalized R2L time delay value. The EWMA calculation uses a 0.25 coefficient. OR Secondary method: The Accumulated time monitored during the R2L Delayed Response Test. AND Pre O2 sensor voltage is above	> 0.6 EWMA (sec) ≥ 2.0 Seconds > 450 mvolts	No Active DTC's	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0151, P0152, P013C, P013D, P014A, P014B, P2272, P2273	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA
					System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control	> 10.0 Volts = Not active = Not active = Not active = Not active		
					Low Fuel Condition Only when FuelLevelDataFault	= False = False		
					Green O2S Condition	= Not Valid, Green O2S condition is		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015C is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary O2 sensor does not achieve the required lower voltage threshold before a delay time threshold is reached.			O2 Heater (pre sensor) on for Learned Htr resistance Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled)	considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 60 seconds = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") > 50 ºC = TRUE) > -40 ºC > 30 seconds 850 ≤ RPM ≤ 2,500 800 ≤ RPM ≤ 2,550 4.0 ≤ gps ≤ 11.5 42.3 ≤ MPH ≤ 80.2 38.5 ≤ MPH ≤ 82.0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Closed loop integral Closed Loop Active Evap Ethanol Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on Time Predicted Catalyst temp Fuel State ================== All of the above met for at least 2.0 seconds, and then the Force Cat Rich intrusive stage is requested. ================== Pre O2S voltage B1S1 at end of Cat Rich stage Fuel State Number of fueled cylinders ================== After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input).	0.87 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables). not in control of purge not in estimate mode > 70 kpa = enabled = not active = not active ≥ 60.0 sec 575 ≤ ºC ≤ 980 = DFCO possible ================ =============== ≥ 710 mvolts = DFCO active <= 5 cylinders ===============		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 2 Sensor 1) (For use w/o WRAF	P015D	DTC P015D detects that the primary oxygen sensor for Bank 2 has delayed response when the air fuel ratio transitions from lean to rich condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor lean to rich tests (P014B / P013D), which commands fuel enrichment. Note: The Primary method is used when the primary O2 sensor signal transitions from lean condition to above the O2 voltage threshold, otherwise the Secondary method is used. Primary method: The P015D diagnostic measures the primary O2 sensor response time between a lean condition and a higher voltage threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in a normalized delay value. The normalized delay is fed into a 1st	Primary method: The EWMA of the Pre O2 sensor normalized L2R time delay value. The EWMA calculation uses a 0.25 coefficient. OR Secondary method: The Accumulated time monitored during the L2R Delayed Response Test. AND Pre O2 sensor voltage is below OR At end of Cat Rich stage the Pre O2 sensor output is	> 0.8 EWMA (sec) ≥ 2.0 Seconds < 450 mvolts < 710 mvolts	No Active DTC's	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0151, P0152, P013C, P013D, P014A, P014B, P015C, P2272, P2273	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA
					P015C test is complete and	= Passed		
					System Voltage	> 10.0 Volts		
					EGR Device Control	= Not active		
					Idle Device Control	= Not active		
					Fuel Device Control	= Not active		
					AIR Device Control	= Not active		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		order lag filter to update the final EWMA result. DTC P015D is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method: This fault is set if the primary O2 sensor does not achieve the required higher voltage threshold before a delay time threshold is reached.			Green O2S Condition	= Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec.		
					O2 Heater (pre sensor) on for	≥ 60 seconds		
					Learned Htr resistance	= Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's")		
					Engine Coolant (Or OBD Coolant Enable Criteria	> 50 ºC = TRUE)		
					IAT	> -40 ºC		
					Engine run Accum	> 30 seconds		
					Engine Speed to initially enable test	850 ≤ RPM ≤ 2,500		
					Engine Speed range to keep test enabled (after initially enabled)	800 ≤ RPM ≤ 2,550		
					Engine Airflow	4.0 ≤ gps ≤ 11.5		
					Vehicle Speed to initially enable test	42.3 ≤ MPH ≤ 80.2		
					Vehicle Speed range to keep test enabled (after initially enabled)	38.5 ≤ MPH ≤ 82.0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Closed loop integral Closed Loop Active Evap Ethanol Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on Time Predicted Catalyst temp Fuel State Number of fueled cylinders ================= When above conditions are met: Fuel Enrich mode is entered. ================ During this test: Engine Airflow must stay between: and the delta Engine Airflow over 12.5msec must be :	0.87 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables). not in control of purge not in estimate mode > 70 kpa = enabled = not active = not active ≥ 60.0 sec 575 ≤ ºC ≤ 980 = DFCO inhibit ≥ 1 cylinders ================= ================= 0 ≤ gps ≤ 11 ≤ 2.0 gps		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Heater Performance Bank 2 Sensor 2	P0161	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. This test compares the measured heater current (monitored thru the low side driver) and compares it to the expected values (over the voltage range provided) for the released sensor. The diagnostic failure counter is incremented if the heater current is outside the expected range. This DTC is set based on the fail and sample counters.	Heater Current outside of the expected range of	0.4 > amps > 4.3	No Active DTC's System Voltage Heater Warm-up delay O2S Heater device control B1S1 O2S Heater Duty Cycle All of the above met for	ECT_Sensor_FA > 10.0 Volts = Complete = Not active > zero > 120 seconds	8 failures out of 10 samples Frequency: 2 tests per trip 10 seconds delay between tests and 1 second execution rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel System Too Lean Bank 1	P0171	Determines if the primary fuel control system for Bank 1 is in a lean condition, based on the filtered long-term and short-term fuel trim. A normally operating system operates centered around long-term fuel trim metric of 1.0. For lean conditions extra fuel trim is required therefor values > 1.0 indicate a Lean condition. A fault is determined, when the long term fuel metric exceeds the threshold value. In addition to the long-term fuel trim limit, the short-term fuel trim metric can be monitored and the fault sets once both threshold values are exceeded. The short-term fuel trim metric is only monitored on programs that have acceptable emissions when the long-term fuel metric reaches its full authority.	The filtered long-term fuel trim metric AND The filtered short-term fuel trim metric (Note: any value below 0.95 effectively nullifies the short-term fuel trim criteria)	>= 1.280 >= 0.100 If a fault has been detected the long-term fuel trim metric must be < 1.150 and the short-term fuel trim metric must be < 1.150 to repass the diagnostic.	Engine speed BARO Coolant Temp Coolant Temp MAP Inlet Air Temp MAF Fuel Level Long Term Fuel Trim data accumulation: Sometimes, certain Long-Term Fuel Trim Cells are not utilized for control and/or diagnosis Closed Loop Long Term FT	400 <rpm< 6,600 > 70 kPa > -20 °C (or OBD Coolant Enable Criteria = TRUE) < 150 °C 5 <kPa< 255 -20 <°C< 150 0.5 <g/s< 510.0 > 10 % or if fuel sender is faulty the diagnostic will bypass the fuel level criteria. > 32.0 seconds of data must accumulate on each trip, with at least 20.0 seconds of data in the current fuel trim cell before a pass or fail decision can be made. (Please see **P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage** in Supporting Tables for a list of cells utilized for diagnosis) Enabled Enabled (Please see "**Closed Loop Enable Clarification**" and "**Long Term FT Enable Criteria**" in Supporting Tables.)	Frequency: 100 ms Continuous Loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					EGR Diag. Catalyst Diag. Post O2 Diag. Device Control EVAP Diag. No active DTC:	Intrusive Test Not Active Intrusive Test Not Active Intrusive Test Not Active Not Active Large Leak Diagnostic (P0455) Not Active IAC_SystemRPM_FA MAP_SensorFA MAF_SensorFA MAF_SensorTFTKO AIR System FA EvapExcessPurgePsbl_FA Ethanol Composition Sensor FA FuelInjectorCircuit_FA EngineMisfireDetected_FA EGRValvePerformance_FA EGRValveCircuit_FA MAP_EngineVacuumStatus AmbPresDfltdStatus TC_BoostPresSnsrFA O2S_Bank_1_Sensor_1_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel System Too Rich Bank 1	P0172	Determines if the fuel control system is in a rich condition, based on the filtered long-term fuel trim metric.A normally operating system operates centered around long-term fuel trim metric of 1.0. For rich conditions less fuel trim is required therefor values < 1.0 indicate a rich condition. There are two methods to determine a Rich fault. They are Passive and Intrusive. A Passive Test decision can be made up until the time that purge is first enabled. From that point forward, rich faults can only be detected by turning purge off intrusively. If during this period of time the filtered long-term fuel trim metric exceeds the threshold a fault will be set. In addition to the long-term fuel trim limit, the short-term fuel trim metric can be monitored and the fault sets once both threshold values are exceeded. The short-	**Passive Test:** The filtered Non-Purge Long Term Fuel Trim metric AND The filtered Short Term Fuel Trim metric (Note: any value above 1.05 effectively nullifies the short-term fuel trim criteria) ***************************** **Intrusive Test:** For 2 out of 3 intrusive segments, The filtered Purge Long Term Fuel Trim metric AND The filtered Non-Purge Long Term Fuel Trim metric AND The filtered Short Term Fuel Trim metric (Note: any value above 1.05 effectively nullifies the short-term fuel trim criteria)	<= 0.720 <= 1.996 ************************ <= 0.730 <= 0.720 <= 1.996 If a fault has been detected (by the passive or intrusive test) the long-term fuel trim metric must be > 0.850 and the short-	***************************** Purge Vapor Fuel	Secondary Parameters and Enable Conditions are identical to those for P0171, with the exception that fuel level is not considered. **************************** <= 18.00 % (Note: values greater than 50% indicate the Purge Vapor Fuel requirement is not being used)	Frequency: 100 ms Continuous Loop ******************* **Segment Definition:** Segments can last up to 45 seconds and are separated by the lesser of 12.0 seconds of purge-on time or enough time to purge 11 grams of vapor. A maximum of 3 completed segments or 15 attempts are allowed for each intrusive test. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		term fuel trim metric is only monitored on programs that have acceptable emissions when the long-term fuel metric reaches its full authority. Once purge is enabled if the filtered Purge Long Term Fuel Trim metric > 0.730 , the test passes without intrusively checking the filtered Non-Purge Long Term Fuel Trim metric. However if the filtered Purge Long Term Fuel Trim metric is <= 0.730 , the Intrusive test is invoked. The purge is ramped off to determine if excess purge vapor is the cause of the rich condition. If during 2 out of 3 intrusive segments, the filtered Purge Long Term Fuel Trim metric <= 0.720 the fault will set. Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics. This is why the intrusive test is operated over several		term fuel trim metric must be > 0.850 to repass the diagnostic. The intrusive test will be enabled at long-term fuel metric values < 0.85 until the diagnostic repasses after a failure.			sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the filtered Purge Long Term Fuel Trim metric > 0.730 for at least 200.0 seconds, indicating that the canister has been purged.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		segments allowing Purge to renable between segments. Likewise, for these reasons, if after the 3 intrusive segments the diagnostic continues to pass, there is a delay period of 300 seconds to allow sufficient time to purge excess vapors from the canister, before re-evaluating a Rich condition if it still exists.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel System Too Lean Bank 2	P0174	Determines if the primary fuel control system for Bank 2 is in a lean condition, based on the filtered long-term and short-term fuel trim. A normally operating system operates centered around long-term fuel trim metric of 1.0. For lean conditions extra fuel trim is required therefor values > 1.0 indicate a Lean condition. A fault is determined, when the long term fuel metric exceeds the threshold value. In addition to the long-term fuel trim limit, the short-term fuel trim metric can be monitored and the fault sets once both threshold values are exceeded. The short-term fuel trim metric is only monitored on programs that have acceptable emissions when the long-term fuel metric reaches its full authority.	The filtered long-term fuel trim metric AND The filtered short-term fuel trim metric (Note: any value below 0.95 effectively nullifies the short-term fuel trim criteria)	>= 1.280 >= 0.100 If a fault has been detected the long-term fuel trim metric must be < 1.150 and the short-term fuel trim metric must be < 1.150 to repass the diagnostic.	Engine speed BARO Coolant Temp Coolant Temp MAP Inlet Air Temp MAF Fuel Level Long Term Fuel Trim data accumulation: Sometimes, certain Long-Term Fuel Trim Cells are not utilized for control and/or diagnosis Closed Loop Long Term FT	400 <rpm< 6,600 > 70 kPa > -20 °C (or OBD Coolant Enable Criteria = TRUE) < 150 °C 5 <kPa< 255 -20 <°C< 150 0.5 <g/s< 510.0 > 10 % or if fuel sender is faulty the diagnostic will bypass the fuel level criteria. > 32.0 seconds of data must accumulate on each trip, with at least 20.0 seconds of data in the current fuel trim cell before a pass or fail decision can be made. (Please see **P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage** in Supporting Tables for a list of cells utilized for diagnosis) Enabled Enabled (Please see "**Closed Loop Enable Clarification**" and "**Long Term FT Enable Criteria**" in Supporting Tables.)	Frequency: 100 ms Continuous Loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					EGR Diag. Catalyst Diag. Post O2 Diag. Device Control EVAP Diag. No active DTC:	Intrusive Test Not Active Intrusive Test Not Active Intrusive Test Not Active Not Active Large Leak Diagnostic (P0455) Not Active IAC_SystemRPM_FA MAP_SensorFA MAF_SensorFA MAF_SensorTFTKO AIR System FA EvapExcessPurgePsbl_FA Ethanol Composition Sensor FA FuelInjectorCircuit_FA EngineMisfireDetected_FA EGRValvePerformance_FA EGRValveCircuit_FA MAP_EngineVacuumStatus AmbPresDfltdStatus TC_BoostPresSnsrFA O2S_Bank_2_Sensor_1_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel System Too Rich Bank 2	P0175	Determines if the fuel control system is in a rich condition, based on the filtered long-term fuel trim metric.A normally operating system operates centered around long-term fuel trim metric of 1.0. For rich conditions less fuel trim is required therefor values < 1.0 indicate a rich condition. There are two methods to determine a Rich fault. They are Passive and Intrusive. A Passive Test decision can be made up until the time that purge is first enabled. From that point forward, rich faults can only be detected by turning purge off intrusively. If during this period of time the filtered long-term fuel trim metric exceeds the threshold a fault will be set. In addition to the long-term fuel trim limit, the short-term fuel trim metric can be monitored and the fault sets once both threshold values are exceeded. The short-	**Passive Test:** The filtered Non-Purge Long Term Fuel Trim metric AND The filtered Short Term Fuel Trim metric (Note: any value above 1.05 effectively nullifies the short-term fuel trim criteria) **************************** **Intrusive Test:** For 2 out of 3 intrusive segments, The filtered Purge Long Term Fuel Trim metric AND The filtered Non-Purge Long Term Fuel Trim metric AND The filtered Short Term Fuel Trim metric (Note: any value above1.05 effectively nullifies the short-term fuel trim criteria)	<= 0.720 <= 1.996 ************************** <= 0.730 <= 0.720 <= 1.996 If a fault has been detected (by the passive or intrusive test) the long-term fuel trim metric must be > 0.850 and the short-	****************************** Purge Vapor Fuel	Secondary Parameters and Enable Conditions are identical to those for P0174, with the exception that fuel level is not considered. ***************************** <= 18.00 % (Note: values greater than 50% indicate the Purge Vapor Fuel requirement is not being used)	Frequency: 100 ms Continuous Loop ******************* **Segment Definition**: Segments can last up to 45 seconds and are separated by the lesser of 12.0 seconds of purge-on time or enough time to purge 11 grams of vapor. A maximum of 3 completed segments or 15 attempts are allowed for each intrusive test. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		term fuel trim metric is only monitored on programs that have acceptable emissions when the long-term fuel metric reaches its full authority. Once purge is enabled if the filtered Purge Long Term Fuel Trim metric > 0.730 , the test passes without intrusively checking the filtered Non-Purge Long Term Fuel Trim metric. However if the filtered Purge Long Term Fuel Trim metric is <= 0.730 , the Intrusive test is invoked. The purge is ramped off to determine if excess purge vapor is the cause of the rich condition. If during 2 out of 3 intrusive segments, the filtered Purge Long Term Fuel Trim metric <= 0.720 the fault will set. Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics. This is why the intrusive test is operated over several		term fuel trim metric must be > 0.850 to repass the diagnostic. The intrusive test will be enabled at long-term fuel metric values < 0.85 until the diagnostic repasses after a failure.			purge excess vapors from the canister. During this period, fuel trim will pass if the filtered Purge Long Term Fuel Trim metric > 0.730 for at least 200.0 seconds, indicating that the canister has been purged.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		segments allowing Purge to renable between segments. Likewise, for these reasons, if after the 3 intrusive segments the diagnostic continues to pass, there is a delay period of 300 seconds to allow sufficient time to purge excess vapors from the canister, before re-evaluating a Rich condition if it still exists.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Temperature Sensor 1 Circuit Low Fault	P0182	This DTC diagnose SENT fuel rail temperature sensor 1 that is too low out of range. If the sensor digital value (represnting the refernce voltage) is below the lower digital threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	Fuel Temperature Sensor 1 SENT digital read value	< 145	Fuel Temperature Out of Range Diagnoistic Enabled	True	50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	SENT Communication Fault Active (P16E4, P16E5) SENT Intenal Error Fault Active (P126E) Fuel Temperature Sensor SENT Message Error Fault Active (P128C)		
					No Fault Pending on	SENT Intenal Error Fault Pending (P126E) Fuel Temperature Sensor SENT Message Error Fault Pending (P128C)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Temperature Sensor 1 Circuit High Fault	P0183	This DTC diagnose SENT fuel rail temperature sensor 1 that is too high out of range. If the sensor digital value (represnting the refernce voltage) is above the upper digital threshold, the high fail counter then increments. If the high fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the high sample counter reaches its threshold.	Fuel Temperature Sensor 1 SENT digital read value	> 1,865	Fuel Temperature Out of Range Diagnoistic Enabled	True	50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	SENT Communication Fault Active (P16E4, P16E5) SENT Intenal Error Fault Active (P126E) Fuel Temperature Sensor SENT Message Error Fault Active (P128C)		
					No Fault Pending	SENT Intenal Error Fault Pending (P126E) Fuel Temperature Sensor SENT Message Error Fault Pending (P128C)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Temperature Sensor 2 Circuit Low Fault	P0187	This DTC diagnose SENT fuel rail temperature sensor 2 that is too low out of range. If the sensor digital value (represnting the refernce voltage) is below the lower digital read threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	Fuel Temperature Sensor 1 SENT digital read value	< 145.00	Fuel Temperature Out of Range Diagnoistic Enabled	True	50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	SENT Communication Fault Active (P16E4, P16E5) SENT Intenal Error Fault Active (P126F) Fuel Temperature Sensor SENT Message Error Fault Active (P128D)		
					No Fault Pending	SENT Intenal Error Fault Pending (P126F) Fuel Temperature Sensor SENT Message Error Fault Pending (P128D)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Temperature Sensor 2 Circuit High Fault	P0188	This DTC diagnose SENT fuel rail temperature sensor 2 that is too high out of range. If the sensor digital value (represnting the refernce voltage) is above the upper digital read threshold, the high fail counter then increments. If the high fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the high sample counter reaches its threshold.	Fuel Temperature Sensor 1 SENT digital read value	> 1,865.00	Fuel Temperature Out of Range Diagnoistic Enabled	True	50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	SENT Communication Fault Active (P16E4, P16E5) SENT Intenal Error Fault Active (P126F) Fuel Temperature Sensor SENT Message Error Fault Active (P128D)		
					No Fault Pending	SENT Intenal Error Fault Pending (P126F) Fuel Temperature Sensor SENT Message Error Fault Pending (P128D)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pressure Sensor "B" Circuit Range/ Performance	P018B	This DTC detects a fuel pressure sensor response stuck within the normal operating range using an intrusive test (as follows) a] Intrusive Test Trigger: 1] Fuel Pump Duty Cycle Clamped Time (min or max duty cycle) >= 5 sec Or 2] Fuel Pres Err Variance <= calibration value KeFRPD_cmp_FPSS_MinPres Variance (typically 0.3 to 0.6); Otherwise, Report status as Pass b] Intrusive test freq limit: 60 sec between intrusive tests that pass, c] Intrusive test Fuel Flow limit: Fuel Flow Actual < Max allowed Fuel Flow rate	Absolute value of fuel pressure change (as sensed during intrusive test)	<= 30 kPa	a] Diagnostic KeFRPD_b _FPSS_DiagEnbld b] Engine Run Time c] Engine Fuel Flow d] Fuel Pump Control Enabled e] Fuel Pump Control State f] Emissions Fuel Level Low g] Validity status VeFRPD_b_FPSS_ DataIntegrityOK IF [1] FRP Circuit Low Fault Active (DTC P018C) [2] FRP Circuit High Fault Active (DTC P018D) [3] Fuel Pump Circuit Low Fault Active (DTC P0231) [4] Fuel Pump Circuit High Fault Active (DTC P0232) [5] Fuel Pump Circuit Open Fault Active (DTC P023F) [6] Reference Voltage Fault Status (DTC P0641) [7] Fuel Pump Control Module Driver Over-	a] == TRUE b] >= 5 sec c] > 0.05 d] == TRUE e] Normal OR Fuel Pres Snsr Stuck Ctrl (rationality) f] <> TRUE g] == TRUE IF [1] <> TRUE [2] <> TRUE [3] <> TRUE [4] <> TRUE [5] <> TRUE [6] <> Active This Key [7] <> TRUE [8] <> TRUE	1 sample / 12.5 millisec Intrusive Test Duration: Fuel Flow - related (5 to 12 sec)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					temperature Fault Active (DTC P1255) [8] Fuel Pump Driver Mod Ign Sw RunStart Pstn Ckt Low Fault Active (DTC P129D) [9] Fuel Pump Driver Control Mod Enable Ckt Perf Fault Active(DTC P12A6)	[9] <> TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pressure Sensor "B" Circuit Low	P018C	This DTC detects if the fuel pressure sensor circuit is shorted low	Fuel Pressure Sensor Voltage Percent, 5.0V Nominal ((Abs(5.0V - SensorV_actual) /5.0V) *100)	< 4.00 % or [0 kPa ga]	Ignition circuit input state	High (Run or Crank)	64 failures / 80 samples 1 sample/12.5 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pressure Sensor "B" Circuit High	P018D	This DTC detects if the fuel pressure sensor circuit is shorted high	Fuel Pressure Sensor Voltage Percent, 5.0V Nominal ((Abs(5.0V - SensorV_actual) /5.0V) *100)	> 96.00 % or [743 kPa ga]	Ignition circuit input state	High (Run or Crank)	64 failures / 80 samples 1 sample/12.5 millisec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Sensor Performance - Dual Sensor	P0191	The DTC determines if there is a skewed control fuel rail sensor (Sensor1) via a comparison to diagnostic sensor (sensor2) continuously when the engine is running and the commanded pressure is steady.	Primary sensor (P1) vs. Secondary sensor (P2) performance rationality **(**(Low Limit fail Filtered Fuel Control Error) OR (High Limit Fail: Filtered Fuel Control Error)**)** AND (FIltered Absolute delta between sensor1 and sensor2	<= **P0191 - Low fail limit of fuel control due to pressure sensor skewed low** (See supporting table) >= **P0191 - High fail limit of fuel control due to high pressure sensor skewed High** (see Supporting table) >= 1.00 mpa Note: fuel control error is calcuated based on the squreroot of senor1 divided by sensor2, this value is filter to ensure proper failure detection. Absolute delta between sensor1 and sensor2 value is filter to ensure proper failure detection.	Dual Sensor Equiped SIDI High Pressure Sensor Performance Diagnostic Enabled Commanded Pressure rate of change (increasing or dercresing) for a period of time	True True < 3.00 mpa >= 1.25 seconds Enabled when a code clear is not active or not exiting device control	Filter Fuel Control Error term and Absolute delta between sensor1 and sensor2 exceed Low or High Fail limit for a duration >= 1.50 seconds This is diagnostic runs Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure Sensor 1 Out of Range	P0192	This DTC diagnose SENT high pressure sensor 1 that is too low out of range. If the sensor digital value (represnting the refernce voltage) is below the lower digital threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	High Pressure Rail Sensor 1 SENT digital read value	=< 76	SENT High Pressure Sesnor Equiped	True	Engine Sync: 800 failures out of 1,000 samples 3 samples per engine rotaion Time Based: 400 Failuer out of 500 Samples 6.25 ms per Sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 Open Circuit - (SIDI)	P0201	Controller specific output driver circuit diagnoses Injector 1 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 1 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Running	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 Open Circuit - (SIDI)	P0202	Controller specific output driver circuit diagnoses Injector 2 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 2 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 Open Circuit - (SIDI)	P0203	Controller specific output driver circuit diagnoses Injector 3 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 3 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Running	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 Open Circuit - (SIDI)	P0204	Controller specific output driver circuit diagnoses Injector 4 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 4 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 Open Circuit - (SIDI)	P0205	Controller specific output driver circuit diagnoses Injector 5 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 5 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Sec P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 Open Circuit - (SIDI)	P0206	Controller specific output driver circuit diagnoses Injector 6 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 6 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS2 Circuit Low	P0222	Detects a continuous or intermittent short low or open in TPS2 circuit by monitoring the TPS 2 sensor percent Vref and failing the diagnostic when the TPS percent Vref is too low. This diagnostic only runs when battery voltage is high enough.	TPS2 % Vref <	0.250 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P06A3	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS2 Circuit High	P0223	Detects a continuous or intermittent short high in TPS2 circuit by monitoring the TPS 2 sensor percent Vref and failing the diagnostic when the TPS percent Vref is too high. This diagnostic only runs when battery voltage is high enough.	TPS2 % Vref >	4.590 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P06A3	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Secondary Circuit Low	P0231	This DTC detects if the fuel pump control circuit is shorted to low. Per "smart device" design guidelines, Fuel Pump Power device reports a Faulted state enumeration if current >= 18A [25A for high performance variants. FPPM reports Not Faulted enumeration if current < 18A FPPM reports Indeterminate state enumeration if the circuit is not being evaluated during current decision loop due to other conditions.	Power driver output current (Fuel Pump Power Module Driver Circuit Ground Short enumeration)	Current >= 18.0 A	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Diagnostic KeFRPR_b_FPPM_DrvrGshtDiagEnbld c) Fuel Pump Control Enable command d) Fuel Pump Control Enable time e) System Voltage f] FPPM Driver Status Alive Rolling Count Sample Faulted g] Diagnostic feedback received h] Fuel Pump Power Module output current	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == TRUE d) >= 40.00 e) 9v < System V > 32v f] <> TRUE g] == TRUE h] < 75A	64 failures / 80 samples 1 sample/12.5 millisec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Secondary Circuit High	P0232	This DTC detects if the fuel pump control circuit is shorted to high voltage Per "smart device" design guidelines, Fuel Pump Power device reports a Faulted state enumeration if circuit voltage >= 4V. FPPM reports Not Faulted enumeration if circuit voltage < 4V. FPPM reports Indeterminate state enumeration if the circuit is not being evaluated during current decision loop due to other conditions.	Voltage offset relative to low state level of duty cycle pulse measured at fuel pump circuit	> 4.0 V	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Diagnostic KeFRPR_b_FPPM_DrvrPshtDiagEnbld c) Fuel Pump Control Enabled d] FPPM Arbitrated Fu Pmp Duty Cycle Rate of Change e] System voltage f] FPPM Driver Status Alive Rolling Count Sample Faulted g] Diagnostic feedback Received	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == TRUE d] >= -100.00 e] 9v < System V > 32v f] <> TRUE g] == TRUE	64 failures / 80 samples 1 sample / 12.5 millisec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Secondary Circuit Open	P023F	This DTC detects if the fuel pump control circuit is open Per "smart device" design guidelines, Fuel Pump Power device reports a Faulted state enumeration if current <= 1A . FPPM reports Not Faulted enumeration if current > 1A. FPPM reports Indeterminate state enumeration if the circuit is not being evaluated during current decision loop due to other conditions.	Output driver current (Fuel Pump Power Module Driver Circuit Open enumeration)	Current <= 1.0 A	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Diagnostic KeFRPR_b_FPPM_OpenCktDiagEnbld c) Arbitrated Fuel Pump Duty Cycle (%) d] Fuel Pump Control Enable Faulted e] FPPM Fuel Pmp Driver Over-temperature Faulted f] FPPM Driver Status Alive Rolling Count Sample Faulted g] Diagnostic feedback received h] System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) > 53.89 d] <> TRUE e] <> TRUE f] <> TRUE g] == TRUE h] 9v < System V > 32v	40 test failures / 80 test samples; 1 sample/12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 Low side circuit shorted to ground (SIDI)	P0261	Controller specific output driver circuit diagnoses Injector 1 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 <= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 Low side circuit shorted to power (SIDI)	P0262	Controller specific output driver circuit diagnoses Injector 1 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 Low side circuit shorted to ground (SIDI)	P0264	Controller specific output driver circuit diagnoses Injector 2 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 Low side circuit shorted to power (SIDI)	P0265	Controller specific output driver circuit diagnoses Injector 2 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 Low side circuit shorted to ground (SIDI)	P0267	Controller specific output driver circuit diagnoses Injector 3 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 <= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 Low side circuit shorted to power (SIDI)	P0268	Controller specific output driver circuit diagnoses Injector 3 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 Low side circuit shorted to ground (SIDI)	P0270	Controller specific output driver circuit diagnoses Injector 4 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 Low side circuit shorted to power (SIDI)	P0271	Controller specific output driver circuit diagnoses Injector 4 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 Low side circuit shorted to ground (SIDI)	P0273	Controller specific output driver circuit diagnoses Injector 5 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 <= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 Low side circuit shorted to power (SIDI)	P0274	Controller specific output driver circuit diagnoses Injector 5 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 Low side circuit shorted to ground (SIDI)	P0276	Controller specific output driver circuit diagnoses Injector 6 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 Low side circuit shorted to power (SIDI)	P0277	Controller specific output driver circuit diagnoses Injector 6 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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 various terms derived from crankshaft velocity. The rate of misfire over an interval is compared to both emissions and catalyst damaging thresholds. The pattern of crankshaft acceleration after the misfire is checked to differentiate between real misfire and other sources of crank shaft noise.	Crankshaft Deceleration Value(s) vs. Engine Speed and Engine load The equation used to calculate deceleration value is tailored to specific vehicle operating conditions. The selection of the equation used is based on the 1st single cylinder continuous misfire threshold tables encountered that are not max of range. If all tables are max of range at a given speed/load, that speed load region is an ***Undetectable region*** see Algorithm Description Document for additional details. SINGLE CYLINDER CONTINUOUS MISFIRE((Medres_Decel Medres_Jerk OR (Medres_Decel Medres_Jerk OR (Lores_Decel Lores_Jerk OR (Lores_Decel Lores_Jerk OR RevBalanceTime)	- see details of thresholds on Supporting Tables Tab > **IdleSCD_Decel** AND > **IdleSCD_Jerk)** > **SCD_Decel** AND > **SCD_Jerk)** > **IdleCyl_Decel** AND > **IdleCyl_Jerk)** > **CylModeDecel** AND > **CylModeJerk)** >**RevMode_Decel**	Engine Run Time Engine Coolant Temp Or If ECT at startup Then ECT System Voltage + Throttle delta - Throttle delta Early Termination option: (used on plug ins that may not have enough engine run time at end of trip for normal interval to complete.)	> 2 crankshaft revolution -10 ºC < ECT < 126 ºC < -10 ºC 21 ºC < ECT < 126 ºC 9.00 < volts < 32.00 < 60.00 % per 25 ms < 90.00 % per 25 ms Not Enabled	Emission Exceedence = any (5) failed 200 rev blocks out of (16) 200 rev block tests Failure reported for (1) Exceedence in 1st (16) 200 rev block tests, or (4) Exceedences thereafter. OR when Early Termination Reporting = Enabled and engine rev > 1,000 revs and < 3,200 revs at end of trip any Catalyst Exceedence = (1) 200 rev block as data supports for catalyst damage.	Type A, 1 Trips (Mil Flashes with Catalyst damage level of Misfire)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			***************************** **This Feature not used on Gasoline engines** Combustion Modes that force selection of Idle Tables *****************************	************************* **This Feature not used on Gasoline engines** **CombustModeIdleTbl** in Supporting Tables *************************			Catalyst Failure reported with (1 or 3) Exceedences in FTP, or (1) Exceedence outside FTP. Continuous	
			Other patterns of misfire use adjustments to the single cylinder continuous misfire threshold tables: RANDOM MISFIRE Use random misfire thresholds If no misfire for	> 6 Engine Cycles				
			(Medres_Decel AND Medres_Jerk)	> **IdleSCD_Decel** * **Random_SCD_Decel** > **IdleSCD_Jerk** * **Random_SCD_Jerk**				
			OR (Medres_Decel AND Medres_Jerk)	> **SCD_Decel** * **Random_SCD_Decel** > **SCD_Jerk** * **Random_SCD_Jerk**				
			OR (Lores_Decel AND Lores_Jerk)	> **IdleCyl_Decel** * **RandomCylModDecel** > **IdleCyl_Jerk** * **RandomCylModJerk**				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR (Lores_Decel AND Lores_Jerk) OR RevBalanceTime PAIRED CYLINDER MISFIRE If a cylinder & it's pair are above PAIR thresholds (Medres_Decel AND Medres_Jerk) OR (Medres_Decel AND Medres_Jerk) OR (Lores_Decel AND Lores_Jerk) OR (Lores_Decel AND Lores_Jerk)	> **CylModeDecel * RandomCylModDecel** > **CylModeJerk * RandomCylModJerk** > **RevMode_Decel * RandomRevModDecl** > **IdleSCD_Decel * Pair_SCD_Decel** > **IdleSCD_Jerk * Pair_SCD_Jerk** > **SCD_Decel * Pair_SCD_Decel** > **SCD_Jerk * Pair_SCD_Jerk** > **IdleCyl_Decel * PairCylModeDecel** > **IdleCyl_Jerk * PairCylModeJerk** > **CylModeDecel * PairCylModeDecel** > **CylModeJerk * PairCylModeJerk**				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR (Revmode Active AND (within one engine cycle: 2nd largest Lores_Decel) AND Above TRUE for)) BANK MISFIRE Cylinders above Bank Thresholds (Medres_Decel AND Medres_Jerk) OR (Medres_Decel AND Medres_Jerk) OR (Lores_Decel AND Lores_Jerk) OR (Lores_Decel AND Lores_Jerk)	> **CylModeDecel * PairCylModeDecel** > 40 engine cycles out of 100 engine cycles >= 2 cylinders > **IdleSCD_Decel** * **Bank_SCD_Decel** > **IdleSCD_Jerk** * **Bank_SCD_Jerk** > **SCD_Decel** * **Bank_SCD_Decel** > **SCD_Jerk** * **Bank_SCD_Jerk** > **IdleCyl_Decel** * **BankCylModeDecel** >**IdleCyl_Jerk** * **BankCylModeJerk** > **CylModeDecel** * **BankCylModeDecel** > **CylModeJerk** * **BankCylModeJerk**				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CONSECUTIVE CYLINDER MISFIRE 1st cylinder uses single cyl continuous misfire thresholds; 2nd Cylinder uses: (Medres_Decel AND Medres_Jerk) OR (Medres_Decel AND Medres_Jerk) OR (Lores_Decel AND Lores_Jerk) OR (Lores_Decel AND Lores_Jerk) CYLINDER DEACTIVATION MODE (Active Fuel Managment)	> **IdleSCD_Decel * ConsecSCD_Decel** > **IdleSCD_Jerk * ConsecSCD_Jerk** > **SCD_Decel * ConsecSCD_Decel** > **SCD_Jerk * ConsecSCD_Jerk** > **IdleCyl_Decel * ConsecCylModDecel** > **IdleSCD_Jerk * ConsecCylModeJerk** > **CylModeDecel * ConsecCylModDecel** > **CylModeJerk * ConsecCylModeJerk**				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AFM: SINGLE CYLINDER CONTINUOUS MISFIRE (CylAfterDeacCyl_Decel AND CylAfterDeacCyl_Jerk) OR (CylBeforeDeacCylDecel AND CylBeforeDeacCyl_Jerk) AFM: RANDOM MISFIRE Use random misfire thresholds If no misfire for (CylAfterDeacCyl_Decel AND CylAfterDeacCyl_Jerk) (CylBeforeDeacCylDecel AND CylBeforeDeacCyl_Jerk)	> **CylModeDecel** * **ClyAfterAFM_Decel** > **CylModeJerk** * **CylAfterAFM_Jerk** > **CylModeDecel** * **CylBeforeAFM_Decel** > **CylModeJerk** * **ClyBeforeAFM_Jerk** > 6 Engine Cycles > **CylModeDecel** * **ClyAfterAFM_Decel** * **RandomAFM_Decl** > **CylModeJerk** * **CylAfterAFM_Jerk** * **RandomAFM_Jerk** > **CylModeDecel** * **CylBeforeAFM_Decel** * **RandomAFM_Decl** > **CylModeJerk** * **ClyBeforeAFM_Jerk** * **RandomAFM_Jerk** - see details on Supporting Tables Tab				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Misfire Percent Emission Failure Threshold	≥ 2.25 % P0300				
			Misfire Percent Catalyst Damage	> **Catalyst_Damage_Misfire_Percentage** in Supporting Tables whenever secondary conditions are met.	(at low speed/loads, one cylinder may not cause cat damage)			
					Engine Speed	> 1,500 rpm AND		
					Engine Load	> 30 % load AND		
					Misfire counts	< 180 counts on one cylinder		
			When engine speed and load are less than the FTP cals (3) catalyst damage exceedences are allowed.	≤ 0 FTP rpm AND ≤ 0 FTP % load				
					Engine Speed	400 < rpm < ((Engine Over Speed Limit) - 150) OR 8,191) Engine speed limit is a function of inputs like Gear and temperature see **EngineOverSpeedLimit** in supporting tables	4 cycle delay	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					No active DTCs:	TPS_FA EnginePowerLimited MAF_SensorTFTKO MAP_SensorTFTKO IAT_SensorTFTKO ECT_Sensor_Ckt_TFTKO 5VoltReferenceB_FA CrankSensor_TFTKO CrankSensor_FA CamLctnIntFA CamLctnExhFA CamSensorAnyLctnTFTKO AnyCamPhaser_FA AnyCamPhaser_TFTKO AmbPresDfltdStatus	4 cycle delay	
					P0315 & engine speed	> 1,000 rpm	4 cycle delay	
					Fuel Level Low	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 or POPD intrusive diagnostic running	4 cycle delay	
					Fuel System Status	≠ Fuel Cut	4 cycle delay	
					Active FuelManagement	Transition in progress	7 cycle delay	
					Undetectable engine speed and engine load region	***Undetectable region*** from Malfunction Criteria	4 cycle delay	
					Abusive Engine Over Speed	> 8,192 rpm	0 cycle delay	
					Below zero torque (except	< **ZeroTorqueEngLoad**	4 cycle delay	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					CARB approved 3000 rpm to redline triangle.)	or <**ZeroTorqueAFM** if AFM is active in Supporting Tables		
					Below zero torque: TPS Vehicle Speed	≤ 0.6 % (≤ 0.9 % in AFM) > 19 mph (> 19 mph AFM)	4 cycle delay	
					NEGATIVE TORQ AFM If deactivated cylinders appear to make power, torque is negative: DeactivatedCyl_Decel AND DeactivatedCyl_Jerk AND # of Deact Cyls Inverted	<**DeacCylInversionDecel** <**DeacCylInversionJerk** > 2 cylinders	2 cycle delay	
					EGR Intrusive test	if active	0 cycle delay	
					Manual Trans	Clutch shift	4 cycle delay	
					Accel Pedal Position AND Automatic transmission shift	> 95.00 %	7 cycle delay	
					After Fuel resumes on Automatic shift containing Fuel Cut		2 Cylinder delay	
					Delay if PTO engaged	Enabled	4 cycle delay	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					*****************************	*****************************	******************	
					This Feature not used on Gasoline engines			
					Combustion Mode	= **InfrequentRegen** value in Supporting Tables	0 cycle delay	
					Driver cranks before Wait to Start lamp extinguishes	IF TRUE	**WaitToStart** cycle delay	
					Brake Torque	> 199.99 % Max Torque	0 cycle delay	
					*****************************	*****************************	******************	
					DRIVELINE RING FILTER After a low level misfire, another misfire may not be detectable until driveline ringing ceases. If no ringing seen, stop filter early.			
					Filter Driveline ring:	> "**Ring Filter**" # of engine cycles after misfire in Supporting Tables		
					Stop filter early:	> "**Number of Normals**" # of engine cycles after misfire in Supporting Tables tab		
					ABNORMAL ENGINE SPEED OSCILLATION: (checks each "misfire" candidate in 100 engine Cycle test to see if it looks like some disturbance like rough road (abnormal).)			
					Used Off Idle, and while not shifting,			
					TPS	> 3 %		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Engine Speed Veh Speed Auto Transmission	> 900 rpm > 3 mph not shifting		
					indivdual candidate deemed abnormal if number of consecutive decelerating cylinders after "misfire": (Number of decels can vary with misfire detection equation) Consecutive decels while in SCD Mode Cyl Mode Rev Mode	 > **Abnormal SCD Mode** > **Abnormal Cyl Mode** > **Abnormal Rev Mode** in Supporting Tables		
					At the end of 100 engine cycle test, the ratio of abnormal/candidate is checked to confirm if real misfire is present within the 100 engine cycles. abnormal candidates/ total candidates	 > 0.50 ratio	discard 100 engine cycle test	
					MISFIRE CRANKSHAFT PATTERN RECOGNITION checks each "misfire" candidate in 100 engine Cycle test to see if overall crankshaft pattern looks like real misfire			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					(recognized), or some disturbance like rough road (unrecognized). At the end of 100 engine cycle test, the ratio of unrecog/recognized is checked to confirm if real misfire is present within the 100 engine cycles. Typically used for checking a single misfire per engine cycle but can support some other patterns on some packages			
					Pattern Recog Enabled:	Enabled		
					Pattern Recog Enabled during Cylinder Deac	Enabled		
					Pattern Recog Enabled consecutive cyl pattrn	Enabled		
					Engine Speed	700 < rpm < 6,500		
					Veh Speed	> 0.6 mph		
					The 1st check for "recognized" is the 1st fired cylinder after the misfire candidate should both accelerate and jerk an amount based acceleration and jerk of Single Cylinder Misfire thresholds in effect at that speed and load.			
					(CylAfter_Accel AND	> Misfire_ decel *** 1st_FireAftrMisfr_Acel**		
					CylAfter_Jerk)	> Misfire_Jerk *** 1st_FireAftrMisfr_Jerk**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Or if AFM mode is active: > Misfire_ decel * **1stFireAftrMisAcelAFM** > Misfire_Jerk * **1stFireAfterMisJerkAFM**		
					Addtionally, the crankhaft is checked again a small calibratible number of cylinders later to see if the distrubance is still large like rough road, or has calmed down like real misfire. The size of disturbance is compared to a multiplier times the ddt_jerk value used to detect misfire at that speed and load. If there is repetitive misfire on consecutive engine cycles, the expected snap is adjusted due to the higher expected disturbance.			
					Num of Cylinders after misfire to start check of crankshaft snap	2 Cylinders		
					"misfire" recognized if: Crankshaft snap after: isolated "misfire"	< Misfire_Jerk * **SnapDecayAfterMisfire**		
					repetative "misfire"	< Misfire_Jerk * **SnapDecayAfterMisfire * RepetSnapDecayAdjst** in Supporting Tables		
					At the end of 100 engine			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					cycle test, the ratio of unrecog/recognized is checked to confirm if real misfire is present.			
					Ratio of Unrecog/Recog	> 0.70	discard 100 engine cycle test	
					:			
					NON-CRANKSHAFT BASED ROUGH ROAD:	Disabled		
					Rough Road Source	TOSS		
					IF Rough Road Source = WheelSpeedInECM			
					ABS/TCS	active		
					Wheel speed noise	> **WSSRoughRoadThres**	discard 100 engine cycle test	
					VSES	active		
					IF Rough Road Source = "FromABS"			
					ABS/TCS	active	discard 100 engine cycle test	
					RoughRoad	detected		
					VSES	active		
					IF Rough Road Source = "TOSS"			
					TOSS dispersion	>**TOSSRoughRoadThres** in supporting tables	discard 100 engine cycle test	
					AND No Active DTCs	Transmission Output Shaft Angular Velocity Validity		
						TransmissionEngagedState_FA (Auto Trans only)	4 cycle delay	
						ClutchPstnSnsr FA (Manual Trans only)		

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	This DTC determines if the crankshaft sensor learn values that are stored in memory are valid. The angle between each tooth of the reluctor wheel is learned, and the sum of all angles together should sum to 360° (one revolution of the reluctor wheel). Default values, or corrupted values will not sum to 360°.	The Crankshaft target wheel should be 360 degrees around in circumferance. Loss or controller non-volitile memory or an error in memory will cause the values of individual teeth learn to be defaulted or incorrect. Set the DTC if the Differance between the sum of the reluctor wheel's teeth and 360 degrees is greater than:	> 0.001 degrees	OBD Manufacturer Enable Counter	MEC = 0	0.50 seconds Frequency Continuous100 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Performance Per Cylinder	P0324	This diagnostic checks for knock sensor performance out of the normal expected range on a per cylinder basis due to Excessive Knock (either real or false knock). In the knock detection algorithm, the term "Knock Intensity" (KI) is used to define the relative size of a knock event, and is calculated as (KI = current knock event - knock threshold). This results in a KI amplitude that is proportional to the size of the knock event (as seen by the knock sensor). In addition, Knock Intensity cannot be less than zero as it is forced/limited to be = 0 with no knock detected (i.e. whenever the current knock event < knock threshold, KI = 0). This diagnostic calculates a first-order lag filter version of the Knock Intensity and sets a fault when: (Filtered KI) > (Excessive Knock Diagnostic Threshold)	Filtered Knock Intensity (where 'Knock Intensity' = 0 with no knock; and > 0 & proportional to knock magnitude with knock)	**> P0324_PerCyl_ExcessiveKnock_Threshold** (no units)	Diagnostic Enabled? Engine Run Time Engine Speed Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature Cumlative Number of Engine Revs Above Min Eng Speed (per key cycle)	Yes ≥ 2.0 seconds ≥ 400 RPM AND ≤ 8,500 RPM ≥ 400 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C ≥ 84 revs	First Order Lag Filters with Weight Coefficient = 0.0480 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit Bank 1	P0325	This diagnostic checks for an open in the knock sensor circuit Sensor 1/Bank 1. There are two possible methods used: 1. **20 kHz Method**: This method injects a 20 kHz signal (internal to the ECU) onto one of the Knock Sensor inputs. For a normal/ good circuit the 20 kHz signal will propogate through the Knock sensor and back to the ECU through the sensor return circuit. The 20 kHz signal is processed through the Fast Fourier Transform (FFT) and then filtered with a first-order lag filter. Since the Knock Detection algorithm uses a Differential Op-Amp to compare the input from the two knock sensor wires, the FFT 20 kHz diagnostic signal will have either: A. Low output with a good circuit (because the 20 kHz injected signal is detected on both of the sensor inputs) or B, High output for an Open Circuit (because	Open Circuit Method chosen (2 possible methods: 20 kHz or Normal Noise): Filtered FFT Output Filtered FFT Output	= **P0325_P0330_OpenMethod_2** **Case 1 (20 kHz Method):** **> P0325_P0330_OpenCktThrshMin (20 kHz) AND < P0325_P0330_OpenCktThrshMax (20 kHz)** **Case 2 (Normal Noise Method):** **> P0325_P0330_OpenCktThrshMin (Normal Noise) AND < P0325_P0330_OpenCktThrshMax (Normal Noise)**	Diagnostic Enabled? Engine Run Time Engine Speed Cumulative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature	Yes ≥ 2.0 seconds ≥ 550 RPM and ≤ 8,500 RPM ≥ 67 revs ≥ 50 mg/cylinder and ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C	First Order Lag Filter with Weight Coefficient Weight Coefficient = 0.0100 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the 20 kHz injected signal is detected only on one of the sensor inputs). The 20 kHz method is typically used for the entire operating region of the engine. However, some engines may not have adequate separation between good and bad circuits at high engine speed. In these cases the 20 kHz method is used at low and medium engine speeds, and the "Normal Noise" method is used at high engine speed only. 2. **Normal Noise**: The Normal Noise method monitors the background engine noise level for a selected frequency range output of the knock detection FFT. The background noise (i.e. Normal Noise) is filtered with a first-order lag filter. A good circuit is determined when the filtered Normal Noise signal is greater than the threshold. See Supporting Tables for method definition: **P0325_P0330_OpenM**						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		ethod defines which of the two diagnostic methods is used as a fucntion of engine speed (RPM). Typical implementations: A. Use 20 kHz method at allengine RPM (used when acceptable separation achieved at all RPM) or B. Use 20 kHz method at low/medium RPM and Normal Noise at high RPM						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Performance Bank 1	P0326	This diagnostic checks for knock sensor performance out of the normal expected range, on a per sensor basis. This diagnostic is specifically designed to identify the fault condition where the knock sensor is properly attached electrically, but produces an abnormally low output due to being unattached (or loosely attached) with the mounting bolt (and thus unable to properly transfer the engine vibration energy from the engine block to the knock sensor). The term "Abnormal (engine) Noise" is used to define this diagnostic method. A fault condition is identified when a first-order lag filtered version of the Abnormal Noise signal falls below the diagnostic threshold.	Filtered FFT Intensity (where 'FFT Intensity' = Non-knocking, background engine noise for a selected frequency) Filtered FFT Intensity	**Case 1: Engine not in AFM mode** < **P0326_P0331_AbnormalNoise_Threshold** (Supporting Table) OR **Case 2: Engine is in AFM mode** < **P0326_P0331_AbnormalNoise_Thresh_AFM** (Supporting Table; Engine is in AFM mode)	Diagnostic Enabled? Engine Run Time Engine Speed Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature Individual Cylinders enabled for Abnormal Noise Cumlative Number of Engine Revs Above Min Eng Speed (per key cycle)	Yes ≥ 2.0 seconds ≥ 2,300 RPM (not in AFM mode) OR ≥ 2,300 (in AFM mode) AND ≤ 8,500 RPM ≥ 50 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C **P0326_P0331_AbnormalNoise_CylsEnabled** (Supporting Table) ≥ 222 Revs	First Order Lag Filters with Weight Coefficient = 0.0060 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit Low Bank 1	P0327	This diagnostic checks for an out of range low knock sensor signal. A 3-resistor bias network at each sensor input to the ECM provides a DC diagnostic voltage that will remain within a normal range when the external knock sensor circuit is free of short circuit faults. The diagnostic output is reported as a percentage (0 to 100%) when compared to the 5.0 volt reference voltage.	Sensor Input or Return Signal Line	< 8.0 Percent (of 5.0 Volt reference)	Diagnostic Enabled? Engine Speed	Yes > 0 RPM and < 8,500 RPM	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit High Bank 1	P0328	This diagnostic checks for an out of range high knock sensor signal. A 3-resistor bias network at each sensor input to the ECM provides a DC diagnostic voltage that will remain within a normal range when the external knock sensor circuit is free of short circuit faults. The diagnostic output is reported as a percentage (0 to 100%) when compared to the 5.0 volt reference voltage.	Sensor Input or Return Signal Line	> 39.0 Percent (of 5 Volt Reference)	Diagnostic Enabled? Engine Speed	Yes > 0 RPM and < 8,500 RPM	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit Bank 2	P0330	This diagnostic checks for an open in the knock sensor circuit Sensor 2/Bank 2 There are two possible methods used: 1. **20 kHz Method**: This method injects a 20 kHz signal (internal to the ECU) onto one of the Knock Sensor inputs. For a normal/ good circuit the 20 kHz signal will propogate through the Knock sensor and back to the ECU through the sensor return circuit. The 20 kHz signal is processed through the Fast Fourier Transform (FFT) and then filtered with a first-order lag filter. Since the Knock Detection algorithm uses a Differential Op-Amp to compare the input from the two knock sensor wires, the FFT 20 kHz diagnostic signal will have either: A. Low output with a good circuit (because the 20 kHz injected signal is detected on both of the sensor inputs) or B, High output for an	**Open Circuit Method chosen** (2 possible methods: 20 kHz or Normal Noise): Filtered FFT Output Filtered FFT Output	= **P0325_P0330_OpenMethod_2** (supporting table) **<u>Case 1 (20 kHz Method):</u>** **> P0325_P0330_OpenCktThrshMin (20 kHz) AND < P0325_P0330_OpenCktThrshMax (20 kHz)** **<u>Case 2 (Normal Noise Method):</u>** **> P0325_P0330_OpenCktThrshMin (Normal Noise) AND < P0325_P0330_OpenCktThrshMax (Normal Noise)**	Diagnostic Enabled? Engine Run Time Engine Speed Cumlative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature	Yes ≥ 2.0 seconds ≥ 550 RPM and ≤ 8,500 RPM ≥ 67 revs ≥ 50 mg/cylinder and ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C	First Order Lag Filter with Weight Coefficient Weight Coefficient = 0.0100 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Open Circuit (because the 20 kHz injected signal is detected only on one of the sensor inputs). The 20 kHz method is typically used for the entire operating region of the engine. However, some engines may not have adequate separation between good and bad circuits at high engine speed. In these cases the 20 kHz method is used at low and medium engine speeds, and the "Normal Noise" method is used at high engine speed only. 2. **Normal Noise**: The Normal Noise method monitors the background engine noise level for a selected frequency range output of the knock detection FFT. The background noise (i.e. Normal Noise) is filtered with a first-order lag filter. A good circuit is determined when the filtered Normal Noise signal is greater than the threshold. See Supporting Tables						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		for method definition: **P0325_P0330_OpenMethod** defines which of the two diagnostic methods is used as a fucntion of engine speed (RPM). Typical implementations: A. Use 20 kHz method at allengine RPM (used when acceptable separation achieved at all RPM) or B. Use 20 kHz method at low/medium RPM and Normal Noise at high RPM						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Performance Bank 2	P0331	This diagnostic checks for knock sensor performance out of the normal expected range, on a per sensor basis. This diagnostic is specifically designed to identify the fault condition where the knock sensor is properly attached electrically, but produces an Abnormally low output due to being unattached (or loosely attached) with the the mounting bolt (and thus unable to properly transfer the engine vibration energy from the engine block to the knock sensor). The term "Abnormal (engine) Noise" is used to define this diagnostic method. A fault condition is identified when a first-order lag filtered version of the Abnormal Noise signal falls below the diagnostic threshold.	Filtered FFT Intensity (where 'FFT Intensity' = Non-knocking, background engine noise) Filtered FFT Intensity	**Case 1: Engine <u>not</u> in AFM mode** < **P0326_P0331_AbnormalNoise_Threshold** (Supporting Table) OR **Case 2: Engine <u>is</u> in AFM mode** < **P0326_P0331_AbnormalNoise_Thresh_AFM** (Supporting Table)	Diagnostic Enabled? Engine Run Time Engine Speed Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature Individual Cylinders enabled for Abnormal Noise Cumlative Number of Engine Revs Above Min Eng Speed (per key cycle)	Yes ≥ 2.0 seconds ≥ 2,300 RPM (not in AFM mode) OR > 2,300 (in AFM mode) AND ≤ 8,500 RPM ≥ 50 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C **P0326_P0331_AbnormalNoise_CylsEnabled** (Supporting Table) ≥ 222 Revs	First Order Lag Filters with Weight Coefficient = 0.0060 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit Low Bank 2	P0332	This diagnostic checks for an out of range low knock sensor signal. A 3-resistor bias network at each sensor input to the ECM provides a DC diagnostic voltage that will remain within a normal range when the external knock sensor circuit is free of short circuit faults. The diagnostic output is reported as a percentage (0 to 100%) when compared to the 5.0 volt reference voltage.	Sensor Input or Return Signal Line	< 8.0 Percent (of 5 Volt Reference)	Diagnostic Enabled? Engine Speed	Yes > 0 RPM and < 8,500 RPM	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit High Bank 2	P0333	This diagnostic checks for an out of range high knock sensor signal. A 3-resistor bias network at each sensor input to the ECM provides a DC diagnostic voltage that will remain within a normal range when the external knock sensor circuit is free of short circuit faults. The diagnostic output is reported as a percentage (0 to 100%) when compared to the 5.0 volt reference voltage.	Sensor Input or Return Signal Line	> 39.00 Percent (of 5 Volt Reference)	Diagnostic Enabled? Engine Speed	Yes > 0 RPM and < 8,500 RPM	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position (CKP) Sensor A Circuit	P0335	Diagnostic will fail if a crank sensor pulse was not received during a period of time; if crank sensor pulses are received the diagnostic will pass.	Time since last crankshaft position sensor pulse received	>= 4.0 seconds	Starter engaged AND (cam pulses being received OR (MAF_SensorFA AND Engine Air Flow	 = FALSE > 3.0 grams/second))	Continuous every 100 msec	Type A, 1 Trips
			No crankshaft pulses received	>= 0.1 seconds	Engine is Running Starter is not engaged		Continuous every 12.5 msec	
			No crankshaft pulses received		Engine is Running OR Starter is engaged No DTC Active:	 P0365 P0366	2 failures out of 10 samples One sample per engine revolution	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position (CKP) Sensor A Performance	P0336	1. Fail counts will occur if the engine goes out of synchronization repeatedly over a period of time and will pass if the engine stays in synchronization. 2. Diagnostic will fail if synchronization gap is not found in a specified period of time and will pass if the synchronization gap is found. 3. Diagnostic will fail if the incorrect number of crank sensor teeth are detected in-between detecting the synchronization gap and will pass if the correct number of teeth are seen.	Time in which 10 or more crank re-synchronizations occur	< 10.0 seconds	Engine Air Flow Cam-based engine speed No DTC Active:	>= 3.0 grams/second > 450 RPM P0335	Continuous every 250 msec	Type A, 1 Trips
			No crankshaft synchronization gap found	>= 0.4 seconds	Engine is Running Starter is not engaged		Continuous every 12.5 msec	
			Time since starter engaged without detecting crankshaft synchronization gap	>= 1.5 seconds	Starter engaged AND (cam pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	
			Crank pulses received in one engine revolution OR Crank pulses received in one engine revolution	< 51 > 65	Engine is Running OR Starter is engaged No DTC Active:	P0365 P0366	8 failures out of 10 samples One sample per engine revolution	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A	P0340	Diagnostic will fail if a cam sensor pulse was not received during a period of time; if cam sensor pulses are received the diagnostic will pass.	Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse	>= 5.5 seconds >= 4.0 seconds	Starter engaged AND (crank pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	Type B, 2 Trips
			Fewer than 4 camshaft pulses received in a time	> 3.0 seconds	Engine is running Starter is not engaged		Continuous every 100 msec	
			No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle		Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	
			The number of camshaft pulses received during 100 engine cycles	= 0	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Performance Bank 1 Sensor A	P0341	Diagnostic will fail if an incorrect number of cam sensor pulses are detected over a number of engine cycles and will pass if the number of cam pulses is correct.	The number of camshaft pulses received during first 12 MEDRES events is OR (There are 12 MEDRES events per engine cycle)	< 4 > 6	Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	Type B, 2 Trips
			The number of camshaft pulses received during 100 engine cycles OR	< 398 > 402	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Circuit Bank 2 Sensor A	P0345	Diagnostic will fail if a cam sensor pulse was not received during a period of time; if cam sensor pulses are received the diagnostic will pass.	Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse	>= 5.5 seconds >= 4.0 seconds	Starter engaged AND (crank pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	Type B, 2 Trips
			Fewer than 4 camshaft pulses received in a time	> 3.0 seconds	Engine is running Starter is not engaged		Continuous every 100 msec	
			No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle		Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	
			The number of camshaft pulses received during 100 engine cycles	= 0	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Performance Bank 2 Sensor A	P0346	Diagnostic will fail if an incorrect number of cam sensor pulses are detected over a number of engine cycles and will pass if the number of cam pulses is correct.	The number of camshaft pulses received during first 12 MEDRES events is OR (There are 12 MEDRES events per engine cycle)	< 4 > 6	Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	Type B, 2 Trips
			The number of camshaft pulses received during 100 engine cycles OR	< 398 > 402	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position Sensor - Crankshaft Start Position Incorrect	P034A	Monitors the position of the crankshaft during auto-start's to verify that the crankshaft is in the expected position- diagnostic will fail if the crankshaft is not in the expected range otherwise the diagnostic will pass	Crankshaft position is in error by a number of crankshaft wheel teeth	> 1 crankshaft teeth	Engine has started rotating during a hybrid auto-start Crankshaft position is being verified No Active DTCs:	CrankSensor_FA	1 failures out of 3 samples a sample occurs each time the engine is started	Type B, 2 Trips
			Crankshaft position is in error by at least one crankshaft wheel tooth		Engine has started rotating during a hybrid auto-start Crankshaft position is being verified No Active DTCs:	CrankSensor_FA	4 failures out of 5 samples a sample occurs each time the engine is started	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position Sensor - Crankshaft Direction Incorrect	P034B	Detects if the crankshaft is not rotating in the correct direction- will fail if the engine is reported to be spinning backwards while the engine is running otherwise the diagnostic will pass.	Number of crankshaft sensor reversals within a period of time	>= 3 <= 10.0 seconds	Engine Speed Engine Speed Engine Air Flow Engine Movement Detected No Active DTCs:	> 400 RPM < 2,000 RPM >= 3.0 grams/second CrankSensor_FA	Continuous Every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #1 CIRCUIT	P0351	Diagnoses Cylinder #1 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	$\geq$ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #2 CIRCUIT	P0352	Diagnoses Cylinder #2 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #3 CIRCUIT	P0353	Diagnoses Cylinder #3 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #4 CIRCUIT	P0354	Diagnoses Cylinder #4 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	$\geq$ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #5 CIRCUIT	P0355	Diagnoses Cylinder #5 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	$\geq$ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	> 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #6 CIRCUIT	P0356	Diagnoses Cylinder #6 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	$\geq$ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor B	P0365	Diagnostic will fail if a cam sensor pulse was not received during a period of time; if cam sensor pulses are received the diagnostic will pass.	Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse	>= 5.5 seconds >= 4.0 seconds	Starter engaged AND (crank pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	Type B, 2 Trips
			Fewer than 4 camshaft pulses received in a time	> 3.0 seconds	Engine is running Starter is not engaged		Continuous every 100 msec	
			No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle		Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	
			The number of camshaft pulses received during 100 engine cycles	= 0	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Performance Bank 1 Sensor B	P0366	Diagnostic will fail if an incorrect number of cam sensor pulses are detected over a number of engine cycles and will pass if the number of cam pulses is correct.	The number of camshaft pulses received during first 12 MEDRES events is OR (There are 12 MEDRES events per engine cycle)	< 4 > 6	Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	Type B, 2 Trips
			The number of camshaft pulses received during 100 engine cycles OR	< 398 > 402	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Circuit Bank 2 Sensor B	P0390	Diagnostic will fail if a cam sensor pulse was not received during a period of time; if cam sensor pulses are received the diagnostic will pass.	Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse	>= 5.5 seconds >= 4.0 seconds	Starter engaged AND (crank pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	Type B, 2 Trips
			Fewer than 4 camshaft pulses received in a time	> 3.0 seconds	Engine is running Starter is not engaged		Continuous every 100 msec	
			No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle		Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	
			The number of camshaft pulses received during 100 engine cycles	= 0	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Performance Bank 2 Sensor B	P0391	Diagnostic will fail if an incorrect number of cam sensor pulses are detected over a number of engine cycles and will pass if the number of cam pulses is correct.	The number of camshaft pulses received during first 12 MEDRES events is OR (There are 12 MEDRES events per engine cycle)	< 4 > 6	Crankshaft is synchronized Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged No DTC Active:	CrankSensor_FA	Continuous every MEDRES event	Type B, 2 Trips
			The number of camshaft pulses received during 100 engine cycles OR	< 398 > 402	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Catalyst System Low Efficiency Bank 1	P0420	NOTE: The information below applies to applications that use the Decel Catalyst Monitor Algorithm Oxygen Storage. 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 Rich (intrusive rich) and Lean (decel fuel cutoff) A/F excursions Normalized Ratio OSC Value Calculation Information and Definitions = 1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time) 2. BestFailing OSC value from a calibration	Normalized Ratio OSC Value (EWMA filtered)	< 0.35	All enable criteria associated with P0420 can be found under P2270 - (O2 Sensor Signal Stuck Lean Bank 1 Sensor 2) Rapid Step Response (RSR) feature will initiate multiple tests: If the difference between current EWMA value and the current OSC Normalized Ratio value is and the current OSC Normalized Ratio value is Maximum number of RSR tests to detect failure when RSR is enabled. MAF Predicted catalyst temperature Front O2 Sensor or Front WRAF Rear O2 Sensor General Enable Criteria In addition to the p-codes listed under P2270, the following DTC's shall also	> 0.51 < 0.50 6 > 2.00 g/s < 20.00 g/s < 1,000 ° C > 710.00 mV or > 1.25 EQR > 800.00 mV	1 test attempted per valid decel period Minimum of 1 test per trip Maximum of 3 tests per trip Frequency: Fueling Related : 12.5 ms OSC Measurements: 100 ms Temp Prediction: 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		table (based on temp and exhaust gas flow) 3. WorstPassing OSC value (based on temp and exhaust gas flow) Normalized Ratio Calculation = (1-2) / (3-2) A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part. Refer to the **P0420_WorstPassingOSCTableB1** and **P0420_BestFailingOSCTableB1** in Supporting Tables tab for details The Catalyst Monitoring Test is completed during a decel fuel cutoff event. This fuel cutoff event occurs following a rich instrusive fueling event initiated by the O2 Sensor Signal Stuck Lean Bank 1 Sensor 2 test (P2270). Several conditions must be met in order to execute this test. Additional conditions and their related values			not be set: For switching O2 sensors: For WRAF O2 sensors:	 O2S_Bank_1_Sensor_1_FA O2S_Bank_1_Sensor_2_FA O2S_Bank_2_Sensor_1_FA O2S_Bank_2_Sensor_2_FA WRAF_Bank_1_FA WRAF_Bank_2_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		are listed in the "Secondary Parameters" and "Enable Conditions" section of this document for P2270 (O2 Sensor Signal Stuck Lean Bank 1 Sensor 2)						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Catalyst System Low Efficiency Bank 2	P0430	Note: The information below applies to applications that use the Decel Catalyst Monitor Algorithm Oxygen Storage. 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 Rich (intrusive rich) and Lean (decel fuel cutoff) A/F excursions Normalized Ratio OSC Value Calculation Information and Definitions = 1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time) 2. BestFailing OSC value from a calibration	Normalized Ratio OSC Value (EWMA filtered)	< 0.35	All enable criteria associated with P0430 can be found under P2272 - (O2 Sensor Signal Stuck Lean Bank 2 Sensor 2) Rapid Step Response (RSR) feature will initiate multiple tests: If the difference between current EWMA value and the current OSC Normalized Ratio value is and the current OSC Normalized Ratio value is Maximum number of RSR tests to detect failure when RSR is enabled. MAF Predicted catalyst temperature Front O2 Sensor or Front WRAF Rear O2 Sensor General Enable Criteria In addition to the p-codes listed under P2272, the following DTC's shall also	> 0.59 < 0.50 6 > 2.00 g/s < 20.00 g/s < 1,000 ° C > 710.00 mV or > 1.25 EQR > 800.00 mV	1 test attempted per valid decel period Minimum of 1 test per trip Maximum of 3 tests per trip Frequency: Fueling Related : 12.5 ms OSC Measurements: 100 ms Temp Prediction: 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		table (based on temp and exhaust gas flow) 3. WorstPassing OSC value (based on temp and exhaust gas flow) Normalized Ratio Calculation = (1-2) / (3-2) A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part. Refer to the **P0430_WorstPassing OSCTableB2** and **P0430_BestFailingOS CTableB2** in Supporting Tables tab for details The Catalyst Monitoring Test is completed during a decel fuel cutoff event. This fuel cutoff event occurs following a rich instrusive fueling event initiated by the O2 Sensor Signal Stuck Lean Bank 2 Sensor 2 test (P2272). Several conditions must be met in order to execute this test. Additional conditions and their related values			not be set: For switching O2 sensors: For WRAF O2 sensors:	 O2S_Bank_1_Sensor_1_ FA O2S_Bank_1_Sensor_2_ FA O2S_Bank_2_Sensor_1_ FA O2S_Bank_2_Sensor_2_ FA WRAF_Bank_1_FA WRAF_Bank_2_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		are listed in the "Secondary Parameters" and "Enable Conditions" section of this document for P2272 (O2 Sensor Signal Stuck Lean Bank 2 Sensor 2)						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) System Small Leak Detected (No ELCP - Conventional EVAP Diagnostic with EAT using OAT Sensor)	P0442	This DTC will detect a small leak (≥ 0.020”) in the EVAP system between the fuel fill cap and the purge solenoid. On some applications a small leak is defined as ≥ 0.025”, 0.030”, or 0.150”. 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.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 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. (Please see **P0442 EONV Pressure Threshold (Pascals)** in Supporting Tables). The normalized value is calculated by the following equation: 1 - (peak pressure - peak vacuum) / pressure threshold. The normalized value is entered into EWMA (with 0= perfect pass and 1= perfect fail). When EWMA is the DTC light is illuminated. The DTC light can be turned off if the EWMA is and stays below the EWMA fail threshold for 3 additional consecutive trips.	> 0.59 (EWMA Fail Threshold), ≤ 0.35 (EWMA Re-Pass Threshold)	Fuel Level Drive Time Drive length (ECT OR OBD Coolant Enable Criteria Baro Distance since assembly plant Engine not run time before key off must be Time since last complete test if normalized result and EWMA is passing OR Time since last complete test if normalized result or EWMA is failing Estimated Ambient Temperature (EAT) using OAT sensor at end of drive Conditions for Estimated Ambient Temperature Using OAT Sensor to be	10 % ≤ Percent ≤ 90 % ≥ 600 seconds ≥ 5.0 miles ≥ 63 °C = TRUE) ≥ 70 kPa ≥ 10.0 miles ≤ refer to **P0442 Engine Off Time Before Vehicle Off Maximum as a Function of Estimated Ambient Temperature** in Supporting Tables. ≥ 17 hours ≥ 10 hours 0 °C≤Temperature≤ 35 °C	Once per trip, during hot soak (up to 2,400 sec.). No more than 2 unsuccessful attempts between completed tests.	Type A, 1 Trips EWMA Average run length is 8 to 12 trips under normal condition s Run length is 3 to 6 trips after code clear or non-volatile reset

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the pressure drops (-62) 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 Pa from vacuum peak, the test then completes. If the key is turned on while the diagnostic test is in progress, the test will abort.			Valid			
					******************************	******************************		
					1. Startup OAT is less than previous trip EAT			
					OR			
					2. Startup ECT - previous trip EAT	≤ 0 °C		
					OR			
					3. Engine off time	≥ 7,200 seconds		
					OR			
					4. At startup, time since previous EAT valid and able to learn	≤ 3,600 seconds		
					OR			
					5. EAT - current OAT	0 °C ≤ difference ≤ 2 °C		
					OR			
					6. EAT < current OAT and speed timer	≥ 260 seconds		
					and current OAT - EAT	≤ 2 °C		
					Speed timer increments at 100 msec rate and increments vary based on vehicle speed as follows:			
					vehicle speed < 14 mph	- 0.2 seconds		
					14 mph<speed< 43 mph	0.12 seconds		
					43 mph<speed< 99	0.23 seconds		
					99 mph<speed< 124	0.23 seconds		
					Speed timer can never be less than 0 seconds			
					******************************	******************************		
					1. High Fuel Volatility			
					During the volatility			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					phase, pressure in the fuel tank is integrated vs. volatility time. If the integrated pressure is then test aborts and unsuccessful attempts is incremented. This value equates to an average integrated fuel tank pressure > 1,245 Pa. Please see **P0442 Volatility Time as a Function of Estimate of Ambient Temperature** in Supporting Tables. OR 2. Vacuum Refueling Detected See P0454 Fault Code for information on vacuum refueling algorithm. OR 3. Fuel Level Refueling Detected See P0464 Fault Code for information on fuel level refueling. OR 4. Vacuum Out of Range and No Refueling See P0451 Fault Code for information on vacuum sensor out of range and P0464 Fault Code for information on fuel level refueling.	< -5		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					OR 5. Vacuum Out of Range and Refueling Detected See P0451 Fault Code for information on vacuum sensor out of range and P0464 Fault Code for information on fuel level refueling. OR 6. Vent Valve Override Failed			
					Device control using an off-board tool to control the vent solenoid, cannot exceed during the EONV test	0.50 seconds		
					OR 7. Key up during EONV test			
					No active DTCs:	MAF_SensorFA ECT_Sensor_FA IAT_SensorFA VehicleSpeedSensor_FA IgnitionOffTimeValid AmbientAirDefault FuelLevelDataFault		
					No Active DTC's TFTKO	P0443 P0446 P0449 P0452 P0453 P0455 P0458 P0459		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0498 P0499 P0496		

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) (No ELCP - Conventional EVAP Diagnostic - For 3 DTC Implementation Only)	P0443	Controller specific output driver circuit diagnoses the canister purge solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	Powertrain relay voltage	Voltage ≥ 11.0 volts	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0458 may also set (Canister Purge Solenoid Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) Vent System Performance (No ELCP - Conventional EVAP Diagnostic)	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister. This diagnostic runs with normal purge control and canister vent solenoid commanded open. The diagnostic fails when the FTP sensor vacuum measurement is above a vacuum threshold before it accumulates purge volume above a threshold. The diagnostic passes when it accumulates purge volume above a threshold before the FTP sensor vacuum measurement is above a vacuum threshold.	Vent Restriction Prep Test: Vented Vacuum for OR Vented Vacuum for Vent Restriction Test: Tank Vacuum for before Purge Volume After setting the DTC for the first time, 2 liters of fuel must be consumed before setting the DTC for the second time.	 < -623 Pa 60 seconds > 1,245 Pa 60 seconds > 2,989 Pa 5 seconds ≥ 6 liters	Fuel Level System Voltage Startup IAT Startup ECT BARO No active DTCs: No Active DTC's TFTKO	10 % ≤ Percent ≤ 90 % 11 volts ≤ Voltage ≤ 32 volts 4 °C ≤ Temperature ≤ 35 °C ≤ 35 °C ≥ 70 kPa MAP_SensorFA TPS_FA VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault EnginePowerLimited P0443 P0449 P0452 P0453 P0454 P0458 P0459 P0498 P0499	Once per Cold Start Time is dependent on driving conditions Maximum time before test abort is 1,400 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) Vent Solenoid Control Circuit (ODM) (No ELCP - Conventional EVAP Diagnostic - For 3 DTC Implementation Only)	P0449	Controller specific output driver circuit diagnoses the vent solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedence between signal and controller ground			20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0498 may also set (Vent Solenoid Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit Performance (No ELCP - Conventional EVAP Diagnostic)	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. During the EONV test, the fuel tank vacuum sensor is re-zeroed. A re-zero occurs: 1) At the transition from the volatility phase to the pressure phase. 2) At the transition from the pressure phase to the vacuum phase. The re-zero test determines if the tank vacuum signal falls within a calibratable window about atmospheric pressure. If after some time, the tank vacuum signal does not fall to within the window, the re-zero test exits to the refueling rationality test. The refueling rationality test determines if a refueling event caused the re-zero problem. If so, the re-zero problem is ignored. If a refueling event is not	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) Lower voltage threshold (voltage subtraction below the nominal voltage) 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). When EWMA is the DTC light is illuminated. The DTC light can be turned off if the EWMA is and stays below the EWMA fail threshold for 3 additional consecutive trips.	0.2 volts 0.2 volts > 0.73 (EWMA Fail Threshold), ≤ 0.40 (EWMA Re-Pass Threshold)	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes		This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period.The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.	Type A, 1 Trips EWMA Average run length: 6 Run length is 2 trips after code clear or non-volatile reset

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		detected, then the results of the re-zero test are used to determine if there is a re-zero problem. 1) An individual re-zero test generates a re-zero ratio. The ratio goes from 0.0 to 1.0. 2) A 0.0 means that the re-zero pressure signal achieved exactly atmospheric pressure. 3) A ratio of 1.0 means that the re-zero pressure did not get within the window. 4) Re-zero pressure within the window generates values between 0.0 and 1.0. If a refueling event is not detected, then the resulting re-zero ratio is filtered using an exponentially weighted moving average (EWMA). When the EWMA exceeds a fail threshold, the vacuum re-zero test reports a failure. Once the vacuum re-zero test fails, the EWMA fall below a lower re-pass threshold before it can pass the vacuum re-zero test again.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage (No ELCP - Conventional EVAP Diagnostic)	P0452	This DTC will detect a Fuel Tank Pressure (FTP) sensor signal that is too low out of range. The FTP sensor circuit out of range diagnostic compares the raw sensor voltage to a lower voltage threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the sensor voltage is below the lower voltage threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported for P0452 DTC. A pass is reported for P0452 DTC if the low sample counter reaches its threshold.	FTP sensor signal The normal operating range of the FTP sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~ -3736 Pa).	< 0.15 volts (3.0 % of Vref or ~ 1,495 Pa)	Time delay after sensor power up for sensor warm-up is	0.10 seconds	640 failures out of 800 samples 12.5 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit High Voltage (No ELCP - Conventional EVAP Diagnostic)	P0453	This DTC will detect a Fuel Tank Pressure (FTP) sensor signal that is too high out of range. The FTP sensor circuit out of range diagnostic compares the raw sensor voltage to an upper voltage threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the sensor voltage is above the upper voltage threshold, the high fail counter then increments. If the high fail counter reaches its threshold then a fail is reported for P0453 DTC. A pass is reported for P0453 DTC if the high sample counter reaches its threshold.	FTP sensor signal The normal operating range of the FTP sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~ -3736 Pa).	> 4.85 volts (97.0 % of Vref or ~ -3,985 Pa)	Time delay after sensor power up for sensor warm-up is	0.10 seconds	640 failures out of 800 samples 12.5 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit Intermittent (No ELCP - Conventional EVAP Diagnostic)	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. During the EONV test, an abrupt change in fuel tank vacuum is identified as a possible refueling event. If the abrupt change occurs while the vent valve is closed, the EONV small-leak test aborts and the refueling rationality test starts. If the refueling rationality test detects a refueling event, then the vacuum change is considered "rational." If the refueling rationality test does not detect a refueling event, then the vacuum change is considered "irrational." The vacuum change rationality diagnostic is an "X out of Y" test. 1) Each time the EONV test completes, the (Y) sample counter is incremented. 2) Each time the	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. An abrupt change is defined as a change in vacuum: in the span of 1.0 seconds. But in 12.5 msec. A refueling event is confirmed if the fuel level has a persistent change of for 30 seconds during a 600 second refueling rationality test.	> 112 Pa < 249 Pa > 10 %	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes and the canister vent solenoid is closed		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 2 out of 3 samples are failures. 12.5 ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		rationality test has an irrational result; the (X) fail counter is incremented. 3) If the (X) fail counter reaches the fail limit before the (Y) sample counter reaches the sample limit, the vacuum change rationality test fails. 4) If the (Y) sample counter reaches the limit before the (X) fail counter fails, the vacuum change rationality test passes.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) System Large Leak Detected (No ELCP - Conventional EVAP Diagnostic)	P0455	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the EVAP system. This mode checks for large leaks and blockages when proper driving conditions are met. If these conditions are met, the diagnostic commands the vent valve closed and controls the purge duty cycle to allow purge flow to purge the fuel tank and canister system while monitoring the fuel tank vacuum level. The algorithm accumulates purge flow during the test to determine a displaced purge volume as the test proceeds. If the displaced purge volume reaches a threshold before the fuel tank vacuum level reaches its passing threshold, then a large leak failure is detected. On fuel systems with fuel caps If the first failure of	Purge volume while Tank vacuum After setting the DTC for the first time, 2 liters of fuel must be consumed before setting the DTC for the second time. Weak Vacuum Follow-up Test (fuel cap replacement test) Weak Vacuum Test failed. Passes if tank vacuum Note: Weak Vacuum Follow-up Test can only report a pass.	> 15 liters ≤ 2,740 Pa ≥ 2,740 Pa	Fuel Level System Voltage BARO Purge Flow No active DTCs: No Active DTC's TFTKO If ECT > IAT, Startup temperature delta (ECT-IAT): Startup IAT Startup ECT Weak Vacuum Follow-up Test This test can run following a weak vacuum failure or on a hot restart.	10 % ≤ Percent ≤ 90 % 11 volts ≤ Voltage ≤ 32 volts ≥ 70 kPa ≥ 1.50 % MAP_SensorFA TPS_FA VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault EnginePowerLimited P0443 P0449 P0452 P0453 P0454 P0458 P0459 P0498 P0499 ≤ 8 °C 4 °C≤Temperature≤ 35 °C ≤ 35 °C	Once per cold start Time is dependent on driving conditions Maximum time before test abort is 1,400 seconds Weak Vacuum Follow-up Test With large leak detected, the follow-up test is limited to 0 seconds. Once the MIL is on, the follow-up test runs indefinitely.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		P0455 occurred after a refueling event was detected and the MIL is off for P0455, the MIL will be commanded off after the first pass of P0455 is reported. If the first failure of P0455 did not occur after a refueling event was detected, the MIL will be commanded off on the ignition cycle after the third consecutive pass of P0455 is reported.the MIL will be commanded off on the ignition cycle after the third consecutive pass of P0455 is reported. On fuel systems without fuel caps The P0455 MIL will be commanded off on the ignition cycle after the third consecutive pass of P0455 is reported.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Purge Control Valve Circuit Low (No ELCP - Conventional EVAP Diagnostic)	P0458	Controller specific output driver circuit diagnoses the canister purge solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedence between signal and controller ground	Powertrain relay voltage	Voltage ≥ 11.0 volts	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0443 may also set (Canister Purge Solenoid Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Purge Control Valve Circuit High (No ELCP - Conventional EVAP Diagnostic)	P0459	Controller specific output driver circuit diagnoses the canister purge solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedence between signal and controller power	Powertrain relay voltage	Voltage ≥ 11.0 volts	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 1 Performance (For use on vehicles with mechanical transfer pump dual fuel tanks)	P0461	This DTC will detect a fuel sender stuck in range in the primary fuel tank.	****************************** Fuel Level in Primary and Secondary Tanks Remain in an Unreadable Range too Long ****************************** This subtest is used If fuel volume in primary tank is and fuel volume in secondary tank and remains in this condition for OR ****************************** After Refuel Event ****************************** If the secondary fuel volume changes by 31.0 liters from engine “off” to engine “on” the primary volume should change by 3.0 liters. OR ****************************** Fuel consumed without a Primary Fuel Level Change ****************************** Delta fuel volume change over of fuel consumed by the engine.	 ≥ 43.9 liters < 4.8 liters 14.2 liters of fuel consumed by the engine. < 3 liters 9.8 liters	Engine Running No active DTCs: The shutdown primary tank volume + 3.0 liters must be	 VehicleSpeedSensor_FA < 43.9 liters	250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 1 Circuit Low Voltage	P0462	This DTC will detect a fuel sender stuck out of range low in the primary fuel tank.	Fuel level Sender % of 5V range	< 10 % or 46.41 liters			100 failures out of 125 samples 100 ms / sample	Type B, 2 Trips

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 % of 5V range	> 60 % or 0.00 liters			100 failures out of 125 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 1 Circuit Intermittent (No ELCP - Conventional EVAP Diagnostic)	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. During the EONV test, a change in fuel level is identified as a possible refueling event. If the change occurs while the vent valve is closed, the EONV small-leak test aborts and the refueling rationality test starts. If the refueling rationality test detects a refueling event, the fuel level change is considered “rational.” If the refueling rationality test does not detect refueling, the fuel level change is considered “irrational.” The fuel level change rationality diagnostic is an “X out of Y” test. 1) Each time the EONV test completes, the (Y) sample counter is incremented. 2) Each time the rationality test has an	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, if a refueilng event is not confirmed, then the test sample is considered failing which indicates an intermittent signal problem. An intermittent fuel level signal problem is defined as: The fuel level changes by and does not remain for 30 seconds during a 600 second refueling rationality test.	 > 10 % > 10 %	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 2 out of 3 samples are failures. 100 ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		irrational result; the (X) fail counter is incremented. 3) If the (X) fail counter reaches the fail limit before the (Y) sample counter reaches the sample limit, the fuel level change rationality test fails. 4) If the (Y) sample counter reaches the limit before the (X) fail counter fails, the fuel level change rationality test passes.						

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 Open (ODM) (Not used on EREV)	P0480	Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: ≥ 200 K Ω impedance between signal and controller ground	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P0691 may also set (Fan 1 Short to Ground).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) System Flow During Non-Purge (No ELCP - Conventional EVAP Diagnostic)	P0496	This DTC will determine if the purge solenoid is leaking to engine manifold vacuum. This test checks for purge valve leaks to intake manifold vacuum such that there would always be a small amount of purge flow present. It does this by sealing the EVAP system (purge and vent valve closed) and then monitors fuel tank vacuum level. The fuel tank vacuum level should not increase. If tank vacuum increases above a threshold, a malfunction is indicated. Additional Information This diagnostic test detects purge valve leaks to intake manifold vacuum. It is not intended to detect purge valve leaks to the atmosphere which are monitored by the EONV small leak diagnostic (P0442). The purge valve leak diagnostic exists to helps service replace	Tank Vacuum for Test time	> 2,491 Pa 5 seconds ≤ refer to **P0496 Purge Valve Leak Test Engine Vacuum Test Time (Cold Start) as a Function of Fuel Level** in Supporting Tables. Test time only increments when engine vacuum ≥ 10.0 kPa.	Fuel Level System Voltage BARO Startup IAT Startup ECT Engine Off Time No active DTCs: No Active DTC's TFTKO	10 % ≤ Percent ≤ 90 % 11 volts ≤ Voltage ≤ 32 volts ≥ 70 kPa 4 °C≤Temperature≤ 35 °C ≤ 35 °C ≥ 28,800.0 seconds MAP_SensorFA TPS_FA VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault EnginePowerLimited P0443 P0449 P0452 P0453 P0454 P0458 P0459 P0498 P0499	Once per cold start Cold start: max time is 1,400 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		leaking purge valves that could otherwise be detected with the EONV small leak diagnostic (P0442).						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Vent Solenoid Control Circuit Low (No ELCP - Conventional EVAP Diagnostic)	P0498	Controller specific output driver circuit diagnoses the vent solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedence between signal and controller ground			20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0449 may also set (Vent Solenoid Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Vent Solenoid Control Circuit High (No ELCP - Conventional EVAP Diagnostic)	P0499	Controller specific output driver circuit diagnoses the vent solenoid low sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. If the P0499 is active, an intrusive test is performed with the vent solenoid commanded closed for 15 seconds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedence between signal and controller power			20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Low Engine Speed Idle System	P0506	This DTC indicates that actual engine speed is lower than desired engine speed at idle so that it is out of speed control capability. Testing is performed when basic conditions are met. If filtered engine speed error exceeds a calibrated threshold for a calibrated duration, code is set. This testing is performed continuously per trip if basic conditions are met	Filtered Engine Speed Error. It is calculated with a calibrated filter coefficient Filter coefficient	> 94.00 rpm 0.00350	Baro Coolant Temp Engine run time Ignition voltage Time since gear change Time since a TCC mode change IAT Vehicle speed Commanded RPM delta Idle time For manual transmissions: Clutch Pedal Position or Clutch Pedal Position	> 70 kPa > 60 °C and < 126 °C ≥ 60 sec 32 ≥ volts ≥ 11 ≥ 3 sec > 3 sec > -20 °C ≤ 1.24 mph, 2kph ≤ 25 rpm > 5 sec > 5.00 pct < 5.00 pct PTO not active Transfer Case not in 4WD LowState	Diagnostic runs in every 12.5 ms loop Diagnostic reports pass or fail in 10 seconds once all enable conditions are met	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Off-vehicle device control (service bay control) must not be active. following conditions not TRUE: (VeTESR_e_EngSpdReqIntvType = CeTESR_e_EngSpdMinLimit AND VeTESR_e_EngSpdReqRespType = CeTESR_e_NoSuggestion) Clutch is not depressed		
					No active DTCs	TC_BoostPresSnsrFA ECT_Sensor_FA EnginePowerLimited EGRValveCircuit_FA EGRValvePerformance_FA IAT_SensorCircuitFA EvapFlowDuringNonPurge_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA FuelInjectorCircuit_FA MAF_SensorFA EngineMisfireDetected_FA IgnitionOutputDriver_FA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA FuelLevelDataFault LowFuelConditionDiagnostic Clutch Sensor FA AmbPresDfltdStatus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P2771		
					All of the above met for Idle time	> 5 sec		
						The diagnostic does not run during autostop as engine is shutdown during that time (occurs in a hybrid or 12v start stop vehicle)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Engine Speed Idle System	P0507	This DTC indicates that actual engine speed is higher than desired engine speed at idle so that it is out of speed control capability. Testing is performed when basic conditions are met. If filtered engine speed error exceeds a calibrated threshold for a calibrated duration, code is set. This testing is performed continuously per trip if basic conditions are met	Filtered Engine Speed Error. It is calculated with a calibrated filter coefficient	< -188.00 rpm	Baro	> 70 kPa	Diagnostic runs in every 12.5 ms loop	Type B, 2 Trips
					Coolant Temp	> 60 °C and < 126 °C Must verify	Diagnostic reports pass or fail in 10 seconds once all enable conditions are met	
			Filter coefficient	0.00350				
					Engine run time	≥ 60 sec		
					Ignition voltage	32 ≥ volts ≥ 11		
					Time since gear change	≥ 3 sec		
					Time since a TCC mode change	> 3 sec		
					IAT	> -20 °C		
					Vehicle speed	≤ 1.24 mph, 2kph		
					Commanded RPM delta	≤ 25 rpm		
					For manual transmissions: Clutch Pedal Position	> 5.00 pct		
					or Clutch Pedal Position	< 5.00 pct		
						PTO not active		
						Transfer Case not in 4WD LowState		
						Off-vehicle device control (service bay control) must not be active.		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						following conditions not TRUE: (VeTESR_e_EngSpdReqIntvType = CeTESR_e_EngSpdMinLimit AND VeTESR_e_EngSpdReqRespType = CeTESR_e_NoSuggestion)		
						Clutch is not depressed		
					No active DTCs	TC_BoostPresSnsrFA ECT_Sensor_FA EnginePowerLimited EGRValveCircuit_FA EGRValvePerformance_FA IAT_SensorCircuitFA EvapFlowDuringNonPurge_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA FuelInjectorCircuit_FA MAF_SensorFA EngineMisfireDetected_FA IgnitionOutputDriver_FA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA FuelLevelDataFaultLow FuelConditionDiagnostic Clutch SensorFA AmbPresDfltdStatus P2771		
					All of the above met	> 5 sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					for Idle time	The diagnostic does not run during autostop as engine is shutdown during that time (occurs in a hybrid or 12v start stop vehicle)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Rough Idle	P050D	Monitors the combustion performance when the cold start emission reduction strategy is active by accumulating and determining the percentage of engine cycles that have less than complete combustion relative to the total number of engine cycles in which Dual Pulse is active.	Deceleration index vs. Engine Speed Vs Engine load Deceleration index calculation is tailored to specific vehicle. Tables used are 1st tables encountered that are not max of range. Undetectable region at a given speed/load point is where all tables are max of range point. Incomplete combustion identified by P0300 threshold tables:	(>Idle SCD AND >Idle SCD ddt Tables) OR (>Idle Cyl Mode AND > Idle Cyl Mode ddt Tables)	Misfire Algorithm Enabled (Refer to P0300 for Enablement Requirements) OBD Manufacturer Enable Counter To enable the diagnostic, the Cold Start Emission Reduction Strategy Must Be Active per the following: Catalyst Temperature AND Engine Coolant AND Engine Coolant AND Barometric Pressure In addition, Dual Pulse Strategy Is Enabled and Active Per the following: Engine Speed Accel Position Engine Run Time For the engine speeds and loads in which Dual Pulse is active:	= 0 < 350.00 degC > -10.00 degC <= 56.00 degC >= 72.00 KPa >= 450.00 RPM <= 1,800.00 RPM <= 1.00 Pct < 20 seconds	Runs once per trip when the cold start emission reduction strategy is active and Dual Pulse is enabled and active. Frequency: 100ms Test completes after Dual Pulse is no longer active OR The first 500 engine cycles have been reached	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Dual Pulse Error induced misfires percentage	>= catalyst damaging misfire		
					Dual Pulse Error induced misfires percentage	< 90% of the maximum achieveable catalyst damaging misfire.		
					Engine Cycles	>= 50 < 501		
					The Cold Start Emission Reduction strategy must not be exiting. The strategy will exit per the following:			
					Catalyst Temperature AND Engine Run Time	>= 900.00 degC >= 19.00 seconds		
					OR			
					Engine Run Time	> **P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit** This Extended Engine run time exit table is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details.		
					OR			
					Barometric Pressure	< 72.00 KPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Dual Pulse Strategy will exit per the following:			
					Engine Speed OR	> 2,400.00 RPM		
					Accel Position	> 2.00 Pct		
					Engine Run Time	>= 20 seconds		
					Dual Pulse Strategy will also exit if the any of the "Additional Dual Pulse Enabling Criteria" is not satisfied:			
					"Additional Dual Pulse Enabling Criteria":			
					Green Engine Enrichment	Not Enabled		
					Misfire Converter Protection strategy	Not being requested		
					Engine Metal Overtemp strategy	Not being requested		
					Fuel control state	Open Loop		
					Output State Control	Not being requested for fuel		
					DOD Or DFCO	Not Active		
					Power Enrichment	Not Active		
					Dynamic Power Enrichment	Not Active		
					Piston Protection	Not Active		
					Hot Coolant Enrichment	Not Active		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Injector Flow Test General Enable DTC's Not Set:	Not Active AcceleratorPedalFailure ECT_Sensor_FA IAT_SensorCircuitFA MnfdTempSensorCktFA CrankSensor_FA FuelInjectorCircuit_FA MAF_SensorFA MAP_SensorFA AnyCamPhaser_TFTKO ClutchPstnSnsr FA IAC_SystemRPM_FA IgnitionOutputDriver_FA TPS_FA VehicleSpeedSensor_FA FuelInjectorCircuit_TFTKO FHPR_b_FRP_SnsrCkt_FA FHPR_b_FRP_SnsrCkt_TFTKO FHPR_b_PumpCkt_FA FHPR_b_PumpCkt_TFTKO TransmissionEngagedState_FA EngineTorqueEstInaccurate FuelPumpRlyCktFA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Assist Vacuum Too Low	P050F	Monitors for a brake booster vacuum leak	Brake booster vacuum drift ratio (EWMA) reaches the fail threshold (based on engine running condition) before the sample count threshold is reached, a failure is reported. Engine Running Fail Threshold based on prior diagnostic state (description below) Diagnostic failed prior loop Diagnostic passed prior loop Before the sample counts Engine Stopped Fail Threshold based on prior diagnostic state (description below) Diagnostic failed prior loop Diagnostic passed prior loop Before the sample counts	>= 0.60 >= 0.65 > 0.00 counts >= 0.80 >= 0.90 > 0.00 counts	Diagnostic is enabled and the following conditions are met for engine run conditions: No brake booster vacuum sensor faults active No brake pedal position sensor faults active Brake pedal travel is No mass air flow faults No manifold air pressure faults Mass air flow estimate Manifold air pressure Engine vacuum stability time has reached Difference between brake booster vacuum and manifold air pressure is OR Diagnostic is enabled for the following engine auto off conditions: No brake booster vacuum	Enabled < 8.00 percent - 5.00 percent offset >= 6.00 grams / second <= 20.00 kPa >= 0.70 seconds > 10.00 kPa Enabled	Performed every 100 msecond Minimum time to pass: Engine Running 0.00 second Engine Stopped 0.00 second	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					sensor faults active No brake pedal position sensor faults active Brake pedal travel is No engine movement detected Engine is in AutoStop mode OR Diagnostic is enabled for the following key off conditions: No brake booster vacuum sensor faults active No brake pedal position sensor faults active Brake pedal travel is No engine movement detected Engine is in KeyStop mode	 < 8.00 percent - 5.00 percent offset Disabled < 8.00 percent - 5.00 percent offset		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure (EOP) Sensor Performance - Two Stage Oil Pump	P0521	Determines if the Engine Oil Pressure (EOP) Sensor is stuck or biased in range. The engine oil pressure is compared against thresholds when engine is running and when engine is off.The engine oil pressure rationality diagnostic has two parts: engine runing test and engine off test. The engine running test compares the measured oil pressure to threshold. If the measured oil pressure is out of the thresholds, then the error counter increments. The engine off test compares the measured oil pressure against thresholds after the engine has stopped rotating. If the measured oil pressure is out of the thresholds, then the error counter increments.	**Two Stage Oil Pump EOP Sensor Test with Engine Running** If enabled: To Fail when previously passing with the engine running: Filtered Engine Oil Pressure below expected threshold OR Filtered Engine Oil Pressure above expected threshold To pass when previously failing: Filtered Engine Oil Pressure above low threshold plus an offset OR	Filtered Oil Pressure < **P0521_LowMinOilPresFail - Two Stage Oil Pump** OR Filtered Oil Pressure > (**P0521_P06DD_P06DE_OP_HiStatePressure** * 1.00 + 200.0 kPa) Filtered Oil Pressure > (20.0 kPa+ **P0521_LowMinOilPresFail - Two Stage Oil Pump**) OR	Two Stage Oil Pump is Present = TRUE Engine Running Diagnostic Status Engine Off Rationality Test Diagnostic Reporting Status Oil Pressure Sensor In Use Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 10,000 RPM for longer than 30.0 seconds) Filtered Engine Speed within range Modelled Oil Temperature within range No active DTC's	TRUE Enabled Test not report a fail state Yes ≥ 30.0 seconds ≥ 70.0 kPa FALSE 1,400 RPM ≤ Filtered Engine Speed ≤ 4,000 RPM 40.0 deg C ≤ Oil Temp ≤ 110.0 deg C Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA CrankSensor_FA	≥ 40 errors out of 50 samples. Performed every 100 msec ≥ 10 passes out of 50 samples. Performed every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Filtered Engine Oil Pressure below high threshold minus an offset	Filtered Oil Pressure < (**P0521_P06DD_P06DE_OP_HiStatePressure** * 1.00 + 200.0 kPa) - 20.0 kPa (Details on Supporting Tables Tab: **P0521_LowMinOilPresFail - Two Stage Oil Pump P0521_P06DD_P06DE_OP_HiStatePressure**)				
			Two Stage Oil Pump EOP Sensor Test with Engine Off If enabled: <u>To Fail when previously passing with the engine off:</u> Filtered Engine Oil Pressure greater than threshold	 Filtered Oil Pressure ≥ 48.0 kPa	Two Stage Oil Pump is Present = TRUE Engine Off Rationality Test Diagnostic Status Engine Running Rationality Test Diagnostic Status Modelled Oil Temperature No Engine Movement No active DTC's	TRUE Enabled Test not report a fail state ≥ 70.0 deg C > 10.0 seconds EngineModeNotRunTimer_FA EngOilTempFA EngOilPressureSensorCktFA CrankSensor_FA	≥ 20 errors out of 40 samples. Run once per trip	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure (EOP) Sensor Circuit Low Voltage	P0522	Determines if the Engine Oil Pressure (EOP) Sensor circuit voltage is too low. This diagnostic compares the EOP circuit voltage to the reference voltage.	(Engine Oil Pressure Sensor Circuit Voltage) ÷ 5 Volts) *100	< 5.00 percent Deadband: < 5 percent or > 95 percent	Engine Speed Enable Engine Speed Disable Oil Pressure Sensor In Use Diagnostic Status	> 400 rpm < 350 rpm Yes Enabled	800 failures out of 1,000 samples Performed every 6.25 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure (EOP) Sensor Circuit High Voltage	P0523	Determines if the Engine Oil Pressure (EOP) Sensor circuit voltage is too high. This diagnostic compares the EOP circuit voltage to the reference voltage.	(Engine Oil Pressure Sensor Circuit Voltage) ÷ 5 Volts) *100	> 95.00 percent Deadband: < 5 percent or > 95 percent	Oil Pressure Sensor In Use Diagnostic Status	Yes Enabled	800 failures out of 1,000 samples Performed every 6.25 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Booster Pressure Sensor Performance	P0556	Determines if the Brake Booster Vacuum Sensor is stuck or skewed within the normal operating range by comparing the engine vacuum to the brake booster vacuum when the engine is producing a large amount of vacuum	Engine vs brake booster vacuum sensor values are compared when % throttle < value for a time period. When throttle once again > calibrated value, min and max vacuum sensor values are normalized and subtracted from a 1st order lag filter value of 1. A properly operating vacuum sensor would have a normalized result of 1 or greater. If the normalized result is greater than 1 it is considered 1. The 1st order lag filter value would be 0 in a passing system. 1st order lag fail threshold 1st order lag re-pass threshold	 > 0.20 < 0.5	Throttle Area (with idle included) for time period of Difference in Brake Booster Vacuum For time period of AND Vacuum Delta Diagnostic enabled/ disabled No active DTC's	<= 5.0 Percent for > 3.0 seconds > 0.3 kPa >= 0.2 Seconds >= 15.0 kPa Enabled Fault bundles: MAP_SensorFA TPS_FA BrakeBoosterSensorCktFA	Pass counter incremented when enable conditions are met, pass achieved when counter >= 7 Performed every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Booster Pressure Sensor Circuit Low Voltage	P0557	Determines if the Brake Booster Pressure Sensor circuit voltage is too low	(Brake Booster Pressure Sensor Voltage) ÷ 5 Volts *100	< 5.00 percent	Brake booster diagnostic enabled/disabled Brake booster pressure sensor present	Enabled Present	320 failures out of 400 samples Performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Booster Pressure Sensor Circuit High Voltage	P0558	Determines if the Brake Booster Pressure Sensor circuit voltage is too high	(Brake Booster Pressure Sensor Voltage) ÷ 5 Volts *100	> 95.00 percent	Brake booster diagnostic enabled/disabled Brake booster pressure sensor present	Enabled Present	2,000 failures out of 2,400 samples Performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Mutil-Functon Switch Circuit	P0564	Detect when cruise control multi-function switch circuit (analog) voltage is in an invalid range	Cruise Control analog circuit voltage must be "between ranges" for greater than a calibratable period of time.	The cruise control analog voltage A/D count ratio is considerred to be "between ranges" when the ratio is measured in the following ranges: 0.28 -0.31, 0.415-0.445, 0.585 - 0.615 0.78 - 0.81, 1.005 - 1.035	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 0.500 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control On Switch Circuit	P0565	Detects a failure of the cruise on/off switch in a continously applied state	Cruise Control On switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 20.00 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 20.00 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Resume Circuit	P0567	Detects a failure of the cruise resume switch in a continously applied state	Cruise Control Resume switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 89.000 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 89.000 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Set Circuit	P0568	Detects a failure of the cruise set switch in a continously applied state	Cruise Control Set switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 89.000 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 89.000 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Cancel Switch Circuit	P056C		Cruise Control Cancel switch remains applied for greater than a calibratable period of time.	fail continously in the applied state for greater than 20.00 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 20.00 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Input Circuit	P0575	Determines if cruise switch state received from the BCM is valid.	If x of y rolling count / protection value faults occur, disable cruise for duration of fault	Message <> 2's complement of message Message rollling count<>previous message rolling count value plus one	Cruise Control Switch Serial Data Error Diagnostic Enable Serial communication to BCM Power Mode Engine Running	1.00 No loss of communication = RUN = TRUE	9 failures out of / 17 samples Performed on every received message 9 rolling count failures out of / 17 samples Performed on every received messagw	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit Range/ Performance	P057B	This diagnostic monitors the Brake Pedal Position Sensor for a stuck in range failure	.Brake pedal position sensor movement diagnostic cal is enabled 1.00	True	Brake Pedal Position Sensor Circuit Range / Performance Diagnostic Enable	1.00 ignition voltage > 10.00		MIL: Type A, 1 Trips
			Calculated EWMA value must be greater than calibratable theshold after calibratable number of tests have completed to report a "test passed" for P057B	EWMA value looked up in supporting table **P057B KtBRKI_K_FastTestPointWeight** P057B as a function of calculated brake pedal position delta EWMA value is > 0.80	calculated brake pedal position delta sample counter > 50.00 for fast test OR calculated brake pedal position delta sample counter > 1,000.00 for slow test	calculated brake pedal position delta > 5.15 OR (for slow test) shift lever has been in park once this key cycle vehicle speed >= 5.00 accelerator pedal position < 5.00	total number of EWMA tests > 20.00	
			Calculated EWMA Value must be less than calibratable threshold after calibratable number of tests have completed to report a "test failed" for P057B. This test runs once per key cycle	EWMA value looked up in supporting table **P057B KtBRKI_K_CmpltTestPointWeight** P057B as a function of calculated brake pedal position delta EWMA value is less thatn 0.40	no DTC's active (P057C, P057D)	shift lever has been in park once this key cycle vehicle speed >= 5.00 accelerator pedal position < 5.00	total number of EWMA tests > 2.00	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit Low	P057C	detects short to ground for brake pedal position sensor	If x of y samples are observed below failure threshold, default brake pedal position to zero percent.	5.00	Brake Pedal Position Sensore Low Voltage Diagnostic Enable	1.00	20 / 32.00 counts	MIL: Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit High	P057D	detects open circuit for brake pedal position sensor	If x of y samples are observed above failure threshold, default brake pedal position to zero percent and set DTC	95.00	Brake Pedal Position Sensore High Voltage Diagnostic Enable	1.00	20.00 / 32.00 counts	MIL: Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit Intermittent/ Erratic	P057E	detects noisy / erratic ouput for brake pedal position sensor	If x of y samples are observed above failure threshold, default brake pedal position to zero percent and set DTC	15.00	Brake Pedal Position Sensor Circuit Intermittent / Erratic Diagnostic Enable	1.00	5.00 / 20.00 counts	MIL: Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-function Circuit Low Voltage	P0580	detects short to ground failure for cruise multi-function switch circuit	Cruise Control analog circuit voltage must be in an "Open Short To Ground" range for greater than a calibratable period of time.	The cruise control analog voltage A/D count ratio is considerred to be "open short to ground when the ratio is measured in the following rangs: 0 - 0.185	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 2.00 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-function Circuit High Voltage	P0581		Cruise Control analog circuit voltage must be in "Short To Power" range for greater than a calibratable period of time.	The cruise control analog voltage A/D count ratio is considered to be "short to power" when the ratio is measured in the following range: 1.005 - 1.035	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 2.00 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-Function Input B Circuit	P0589	Detect when cruise control multi-function switch circuit B (analog) voltage is in an illegal range	Cruise Control analog circuit B voltage must be "between ranges" for greater than a calibratable period of time.	The cruise control analog voltage A/D count ratio is considerred to be "between ranges" when the ratio is measured in the following ranges: 0.28 -0.31, 0.415-0.445, 0.585 - 0.615, 0.78 - 0.81, 1.005 - 1.035	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 0.500 seconds	Type C, No MIL ,special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Performance	P058A	This DTC monitors for a battery module internal fault	Battery Module signals an internal fault via LIN bus VeVITR_e_IBS_InternalFault	= CeVITR_e_DiagFailed	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Current Monitoring Performance	P058B	This DTC monitors for a battery module current fault	Battery Module signals an internal fault via LIN bus VeVITR_e_BatCurrRatDiag	= CeVITR_e_DiagFailed	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Temperature Monitoring Performance	P058C	This DTC monitors for a battery module temperature fault	Difference between Battery Module raw temperature values	> 10.00 Celsius	The historical mode diagnostic is enabled and / or The continuous mode diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit For Historical Mode IBS Down Counter (over LIN bus) For Continuous Mode IBS Down Counter (over LIN bus) IBS Temperature Data Available over LIN bus Internal Temperature Circuit Low Fault Active (P16DE) Internal Temperature	= 1 (1 indicates enabled) = 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True Between 1 and 24 = zero = True = False	8 failed samples within 10 total samples Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Circuit High Fault Active (P16DF)	= False		
					Battery Module Temperature Too High Fault Active (P058E)	= False		
					Battery Module Temperature Too Low Fault Active (P058F)	= False		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Voltage Monitoring Performance	P058D	This DTC monitors for a battery module voltage fault	Difference between 12V System Reference Voltage and IBS 12V Battery Voltage values	> 5.00 Volts	The diagnostic is enabled	= 1 (1 indicates enabled)	32 failed samples within 40 total samples Diagnostic runs in the 250 ms loop	Type B, 2 Trips
					System Diagnostics Disabled	= False		
					Power Mode	Not equal off		
					12V System Reference Voltage	> 9.00 Volts		
					LIN Bus Off or Battery Module Communication Faults Active	= False		
					Outside Air Temperature	> -20.00 Celsius and < 50.00 Celsius		
					Outside Air Temperature Validity Bit	= True		
					IBS Voltage and Current Data Available over LIN bus	= True		
					Battery Monitor Module Circuit Low Voltage Fault Active (P16D4)	= False		
					Battery Monitor Module Circuit High Voltage Fault Active (P16D5)	= False		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Temperature Too High	P058E	This DTC monitors for a battery module temperature too high fault	Battery Module raw temperature 2 value	> 120.00 Celsius	The historical mode diagnostic is enabled and / or The continuous mode diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit For Historical Mode IBS Down Counter (over LIN bus) For Continuous Mode IBS Down Counter (over LIN bus) IBS Measure Temperature Data Available over LIN bus	= 1 (1 indicates enabled) = 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True Between 1 and 24 = zero = True	4 failed samples within 5 total samples Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Temperature Too Low	P058F	This DTC monitors for a battery module temperature too low fault	Battery Module raw temperature 2 value	< -43.00 Celsius	The historical mode diagnostic is enabled and / or The continuous mode diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit For Historical Mode IBS Down Counter (over LIN bus) For Continuous Mode IBS Down Counter (over LIN bus) IBS Measure Temperature Data Available over LIN bus	= 1 (1 indicates enabled) = 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True Between 1 and 24 = zero = True	4 failed samples within 5 total samples Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-Function Input B Circuit Low	P0592	detects short to ground failure for cruise multi-function switch circuit B	Cruise Control analog circuit B voltage must be in an "Open Short To Ground" range for greater than a calibratable period of time.	The cruise control Circuit B analog voltage A/D count ratio is considered to be "open short to groun"d when the ratio is measured in the following rangs: 0 - 0.185	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 2.00 seconds	Type C, No MIL ,special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-Function Input B Circuit High	P0593		Cruise Control analog circuit B voltage must be in a "Short To Power" range for greater than a calibratable period of time.	The cruise control Circuit B analog voltage A/D count ratio is considered to be "short to power" when the ratio is measured in the following range: 1.005 - 1.035	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 2.00 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft System Cold Start Performance – Bank 1	P05CC	Detects a VVT system error during Cold Starts by comparing the desired and actual cam positions when VVT is activated. This is the same type diagnostic as P0011 except this detects excessive deviations of position while the cold start phaser positions are being commanded.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive	Cam Position Error > 4.00 deg.	**Intake Cam Phsr Enable**	= TRUE	75 failures out of 100 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Catalyst Warmup Enabled	= TRUE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> 4.00 deg AND < 30.00 deg		
					Desired cam position variation	< 4.50 deg for (**P0011_P05CC_StablePositionTimeIc1**) seconds		
					No Active DTCs	P0010 P2088 P2089		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft System Cold Start Performance – Bank 2	P05CD	Detects a VVT system error during Cold Starts by comparing the desired and actual cam positions when VVT is activated. This is the same type diagnostic as P0021 except this detects excessive deviations of position while the cold start phaser positions are being commanded.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive	Cam Position Error > 4.00 deg.	**Intake Cam Phsr Enable**	= TRUE	1,000 failures out of 100 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Catalyst Warmup Enabled	= TRUE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> 4.00 deg AND < 30.00 deg		
					Desired cam position variation	< 4.50 deg for (**P0021_P05CD_StablePositionTimeIc2**) seconds		
					No Active DTCs	P0020 P2092 P2093		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Read Only Memory (ROM)	P0601	This DTC will be stored if the calibration check sum is incorrect or the flash memory detects an uncorrectable error via the Error Correcting Code.	The Primary Processor's calculated checksum does not match the stored checksum value. Covers all software and calibrations.	1 failure if the fault is detected during the first pass. 5.00 failures if the fault occurs after the first pass is complete.			Diagnostic runs continuously in the background.	Type A, 1 Trips
			The Primary Processor's Error Correcting Code hardware in the flash memory detects an error. Covers all software and calibrations.	254 failures detected via Error Correcting Code			Diagnostic runs continuously via the flash hardware.	
			The Primary Processor's calculated checksum does not match the stored checksum value for a selected subset of the calibrations.	2 consecutive failures detected or 5 total failures detected.			Diagnostic runs continuously. Will report a detected fault within 200 ms.	
			The Secondary Processor's calculated checksum does not match the stored checksum value. Covers all software and calibrations.	1 failure if the fault is detected during the first pass. 5 failures if the fault occurs after the first pass is complete.			Diagnostic runs continuously in the background.	
				In all cases, the failure count is cleared when controller shuts down				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Not Programmed	P0602	This DTC will be stored if the ECU is a service part that has not been programmed.	Service (reflash) controller calibration present	= 1		none	Diagnostic runs at powerup and once per second continuously after that	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ECM Long Term Memory Reset	P0603	This DTC detects an invalid NVM which includes a Static NVM, Perserved NVM, ECC ROM in NVM Flash Region, and Perserved NVM during shut down.	Static NVM region error detected during initialization				Diagnostic runs at controller power up.	Type A, 1 Trips
			Perserved NVM region error detected during initialization				Diagnostic runs at controller power up.	
			ECC ROM fault detected in NVM Flash region ECC ROM Error Count >	 3			Diagnostic runs at controller power up.	
			Perserved NVM region error detected during shut down.				Diagnostic runs at controller power down.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ECM RAM Failure	P0604	Indicates that the ECM has detected a RAM fault. This includes Primary Processor System RAM Fault, Primary Processor Cache RAM Fault, Primary Processor TPU RAM Fault, Primary Processor Update Dual Store RAM Fault, Primary Processor Write Protected RAM Fault, and Secondary Processor RAM Fault. This diagnostic runs continuously.	Indicates that the primary processor is unable to correctly read data from or write data to system RAM. Detects data read does not match data written >=	254 counts			Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop)	Type A, 1 Trips
			Indicates that the primary processor is unable to correctly read data from or write data to cached RAM. Detects data read does not match data written >=	254 counts			Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop)	
			Indicates that the primary processor is unable to correctly read data from or write data to TPU RAM. Detects data read does not match data written >=	5 counts			Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop)	
			Indicates that the primary processor detects a mismatch between the data and dual data is found during RAM updates. Detects a mismatch in data and dual data updates >	0.46666 s			When dual store updates occur.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Indicates that the primary processor detects an illegal write attempt to protected RAM. Number of illegal writes are >	65,534 counts			Diagnostic runs continuously (background loop)	
			Indicates that the secondary processor is unable to correctly read data from or write data to system RAM. Detects data read does not match data written >=	5 counts			Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal ECM Processor Integrity Fault	P0606	Indicates that the ECM has detected an internal processor integrity fault. These include diagnostics done on the SPI Communication as well as a host of diagnostics for both the primary and secondary processsors.	Loss or invalid message of SPI communication from the Secondary Processor at initialization detected by the Primary Processor or loss or invalid message of SPI communication from the Secondary Processor after a valid message was received by the Primary Processor	Loss or invalid message at initialization detected or loss or invalid message after a valid message was recieved	Run/Crank voltage Run/Crank voltage	>= 6.41 Volts or >= 11.00 Volts, else the failure will be reported for all conditions	In the primary processor, 159 / 399 counts intermittent or 39 counts continuous; 39 counts continuous @ initialization. 12.5 ms /count in the ECM main processor	Type A, 1 Trips
			Loss or invalid message of SPI communication from the Primary Processor at initialization detected by the Secondary Processor or loss or invalid message of SPI communication from the Primary Processor after a valid message was received by the Secondary Processor	Loss or invalid message at initialization detected or loss or invalid message after a valid message was recieved			In the secondary processor, 20 / 200 counts intermittent or 0.1875 s continuous; 0.4750 s continuous @ initialization. 12.5 ms /count in the ECM secondary processor	
			Checks for stack over or underflow in secondary processor by looking for corruption of known pattern at stack boundaries. Checks number of stack over/ under flow since last powerup reset >=	5		KeMEMD_b_StackLimitTestEnbl == 1 Value of KeMEMD_b_StackLimitTestEnbl is: 1 . (If 0, this test is disabled)	variable, depends on length of time to corrupt stack	
			MAIN processor is verified by responding to a seed sent from the secondary with a key response to secondary. Checks number of incorrect keys	2 incorrect seeds within 8 messages, 0.2000 seconds		ignition in Run or Crank	150 ms for one seed continually failing	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			received > or Secondary processor has not received a new within time limit					
			Time new seed not received exceeded			always running	0.450 seconds	
			MAIN processor receives seed in wrong order			always running	3 / 17 counts intermittent. 50 ms/count in the ECM main processor	
			2 fails in a row in the Secondary processor's ALU check			KePISD_b_ALU_TestEnbld == 1 Value of KePISD_b_ALU_TestEnbld is: 1 . (If 0, this test is disabled)	25 ms	
			2 fails in a row in the Secondary processor's configuration register masks versus known good data			KePISD_b_ConfigRegTestEnbld == 1 Value of KePISD_b_ConfigRegTestEnbld is: 1 . (If 0, this test is disabled)	12.5 to 25 ms	
			Secondary processor detects an error in the toggling of a hardware discrete line controlled by the MAIN processor: number of discrete changes > = or < = over time window(50ms)	7 17		KePISD_b_MainCPU_SOH_FltEnbld == 1 Value of KePISD_b_MainCPU_SOH_FltEnbld is: 0 . (If 0, this test is disabled) time from initialization >= 0.4875 seconds	50 ms	
			Software background task first pass time to complete exceeds			Run/Crank voltage > 6.41	360.000 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			2 fails in a row in the MAIN processor's ALU check			KePISD_b_ALU_TestEnbld == 1 Value of KePISD_b_ALU_TestEnbld is: 1 . (If 0, this test is disabled)	25 ms	
			2 fails in a row in the MAIN processor's configuration register masks versus known good data			KePISD_b_ConfigRegTestEnbld == 1 Value of KePISD_b_ConfigRegTestEnbld is: 1 . (If 0, this test is disabled)	12.5 to 25 ms	
			Checks number of stack over/under flow since last powerup reset >=	3		KeMEMD_b_StackLimitTestEnbl == 1 Value of KeMEMD_b_StackLimitTestEnbl is: 1 . . (If 0, this test is disabled)	variable, depends on length of time to corrupt stack	
			Voltage deviation >	0.4950		KePISD_b_A2D_CnvrtrTestEnbld == 1 Value of KePISD_b_A2D_CnvrtrTestEnbld is: 1 . (If 0, this test is disabled)	5 / 10 counts or 0.150 seconds continuous; 50 ms/count in the ECM main processor	
			Checks for ECC (error correcting code) circuit test errors reported by the hardware for flash memory. Increments counter during controller initialization if ECC error occured since last controller initialization. Counter >=	3 (results in MIL), 5 (results in MIL and remedial action)		KeMEMD_b_FlashECC_CktTestEnbl == 1 Value of KeMEMD_b_FlashECC_CktTestEnbl is: 1 . (If 0, this test is disabled)	variable, depends on length of time to access flash with corrupted memory	
			Checks for ECC (error	3 (results in MIL),		KeMEMD_b_RAM_ECC_	variable,	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			correcting code) circuit test errors reported by the hardware for RAM memory circuit. Increments counter during controller initialization if ECC error occured since last controller initialization. Counter >=	5 (results in MIL and remedial action)		CktTestEnbl == 1 Value of KeMEMD_b_RAM_ECC_ CktTestEnbl is: 1 . (If 0, this test is disabled)	depends on length of time to write flash to RAMvariable, depends on length of time to write flash to RAM	
			MAIN processor DMA transfer from Flash to RAM has 1 failure			KePISD_b_DMA_XferTest Enbld == 1 Value of KePISD_b_DMA_XferTest Enbld is: 0 . (If 0, this test is disabled)	variable, depends on length of time to write flash to RAM	
			Safety critical software is not executed in proper order.	>= 1 incorrect sequence.		Table, f(Core, Loop Time). See supporting tables: **P0606_Program Sequence Watch Enable f(Core, Loop Time)** (If 0, this Loop Time test is disabled)	Fail Table, f(Loop Time). See supporting tables: **P0606_PSW Sequence Fail f (Loop Time)** / Sample Table, f (Loop Time)See supporting tables: **P0606_PSW Sequence Sample f(Loop Time)** counts 50 ms/count in the ECM main processor	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			MAIN processor determines a seed has not changed within a specified time period within the 50ms task.	Previous seed value equals current seed value.		KePISD_b_SeedUpdKeyStorFltEnbl == 1 Value of KePISD_b_SeedUpdKeyStorFltEnbl is: 1 . (If 0, this test is disabled)	Table, f(Loop Time). See supporting tables: **P0606_Last Seed Timeout f (Loop Time)**	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Control Circuit Open (12VSS)	P0615	Controller specific output driver circuit diagnoses the Starter relay (12VSS) low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground.	Starter control diag enable = TRUE Engine speed Run Crank voltage	1.00 0.00 RPM 11.00 volts	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Control Circuit Low Voltage (12VSS)	P0616	Controller specific output driver circuit diagnoses the Starter relay (12VSS) low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 0.5 Ohms impedance between signal and controller ground	Starter control diag enable = TRUE Engine speed Run Crank voltage	1.00 0.00 RPM 6.41 volts	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Control Circuit High Voltage (12VSS)	P0617	Controller specific output driver circuit diagnoses the Starter relay low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 0.5 Ohms impedance between signal and controller power	Starter control diag enable = TRUE Engine speed Run Crank voltage	1.00 0.00 RPM 6.41 volts	8 failures out of 10 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Relay Control Circuit Low Voltage	P0628	Controller specific output driver circuit diagnoses the Feed Fuel Pump Relay high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 0.5 Ohms impedance between signal and controller ground	Run/Crank Voltage Engine Speed	Voltage 11.00 volts 0 RPM	8 failures out of 10 samples 250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Fuel Injector Control Performance	P062B	This DTC determines the internal fuel injctor control module circuit is faulted. The faulted status is set on any failure that could potentially damage the drivers or injectors, or could result in uncontrolled fueling. The following general classes of failures shall be covered: Communication error with control circuit Internal corruption of control circuit values, Invalid interface values (from control circuit)	Internal ECU Boost Voltage OR Internal ECU Boost Voltage OR Driver Status OR Driver Status	>= 90 Volts <= 40 Volts = Not Ready = Uninitialized	Battery Voltage	>= 8 or >= 11 Enabled when a code clear is not active or not exiting device control Engine is not cranking Powertrain Relay Voltage within range	High Voltage - 160 failures out of 200 samples Low Voltage - 160 failures out of 200 samples Driver Status Not Ready- 160 failures out of 200 samples Driver Status Uninitialized - Uninitialized state for >= 100 counts All at 12.5ms per sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powertrain Internal Control Module EEPROM Error	P062F	This DTC detects a NVM long term performance. There are two types of diagnostics that run during controller power up. One for HWIO reports that writing to NVM (at shutdown) will not succeed, and the other HWIO reports the assembly calibration integrity check has failed.	HWIO reports that writing to NVM (at shutdown) will not succeed				Diagnostic runs at controller power up.	Type B, 2 Trips
			HWIO reports the assembly calibration integrity check has failed				Diagnostic runs at controller power up.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VIN Not Programmed or Mismatched - Engine Control Module (ECM)	P0630	This DTC checks that the VIN is correctly written	At least one of the programmed VIN digits	= 00 or FF	OBD Manufacturer Enable Counter	= 0	250 ms / test Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference #1 Circuit	P0641	Detects a continuous or intermittent short on the 5 volt reference circuit #1 by monitoring the reference percent Vref1 and failing the diagnostic when the percent Vref1 is too low or too high or if the delta between the filtered percent Vref1 and non-filtered percent Vref1 is too large. This diagnostic only runs when battery voltage is high enough.	ECM percent Vref1 < or ECM percent Vref1 > or the difference between ECM filtered percent Vref1 and percent Vref1 >	4.875 % Vref1 5.125 % Vref1 0.0495 % Vref1	Diagnostic enabled AND [(Run/Crank voltage for Time period AND Starter engaged) OR (Run/Crank voltage AND Starter engaged)]	= 1 > 6.41 Volts = 0.02 Seconds = FALSE > 8.41 Volts = TRUE	19 / 39 counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Malfunction Indicator Lamp (MIL) Control Circuit (ODM) Open	P0650	Detects an inoperative malfunction indicator lamp control low side driver circuit. This diagnostic reports the DTC when an open circuit is detected.	Voltage low during driver off state (indicates open circuit)	Open circuit: ≥ 200 K Ω impedance between signal and controller ground	Run/Crank Voltage Remote Vehicle Start is not active	Voltage ≥ 11.00 volts	1 failures out of 1 samples 50 ms / sample	Type B, No MIL NO MIL Note: In certain controllers P263A may also set (MIL Control Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference #2 Circuit	P0651	Detects a continuous or intermittent short on the 5 volt reference circuit #2 by monitoring the reference percent Vref2 and failing the diagnostic when the percent Vref2 is too low or too high or if the delta between the filtered percent Vref2 and non-filtered percent Vref2 is too large. This diagnostic only runs when battery voltage is high enough.	ECM percent Vref2 < or ECM percent Vref2 > or the difference between ECM filtered percent Vref2 and percent Vref2 >	4.875 % Vref2 5.125 % Vref2 0.0495 % Vref2	Diagnostic enabled AND [(Run/Crank voltage for Time period AND Starter engaged) OR (Run/Crank voltage AND Starter engaged)]	= 1 > 6.41 Volts = 0.02 Seconds = FALSE > 8.41 Volts = TRUE	19 / 39 counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powertrain Relay Control (ODM) Open	P0685	Detects an open circuit in the Powertrain Relay driver. This diagnostic reports the DTC when an open circuit failure is present. Monitoring occurs when the output is powered off. A decision is made by comparing a voltage measurement to a controller specific voltage threshold.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 K Ω ohms impedance between signal and controller ground	Run/Crank Voltage	Voltage ≥ 11.00 volts	8 failures out of 10 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0686 may also set (Powertrain Relay Control Short to Ground).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powertrain Relay Control (ODM) Low	P0686	Detects a short to ground in the Powertrain Relay low side driver. This diagnostic reports the DTC when a short to ground failure is present. Monitoring occurs when the output is powered off. A decision is made by comparing a voltage measurement to a controller specific voltage threshold.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Run/Crank Voltage	Voltage ≥ 11.00 volts	8 failures out of 10 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0685 may also set (Powertrain Relay Control Open Circuit).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powertrain Relay Control (ODM) High	P0687	Detects a short to power in the Powertrain Relay low side driver. This diagnostic reports the DTC when a short to power failure is present. Monitoring occurs when the output is powered off. A decision is made by comparing a voltage measurement to a controller specific voltage threshold.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Run/Crank Voltage	Voltage ≥ 11.00 volts	8 failures out of 10 samples 250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powertrain Relay Feedback Circuit High	P0690	Detects higher than expected voltage in the powertrain relay feedback circuit. This diagnostic reports the DTC when higher than expected voltage is present. For example, the powertrain relay could be stuck on. Monitoring occurs when the relay is commanded "off" for a calibrated duration.	Powertrain Relay Voltage	>= 4.00 volts will increment the fail counter	Powertrain relay commanded “OFF”	>= 2.00 seconds	50 failures out of 63 samples 100ms / Sample	Type B, 2 Trips
					No active DTCs:	PowertrainRelayStateOn_FA		

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 Low Voltage (ODM)	P0691	Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P0480 may also set (Fan 1 Open Circuit).

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 High Voltage (ODM)	P0692	Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults	Voltage high during driver on state (indicates short to power)	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference #3 Circuit	P0697	Detects a continuous or intermittent short on the 5 volt reference circuit #3 by monitoring the reference percent Vref3 and failing the diagnostic when the percent Vref3 is too low or too high or if the delta between the filtered percent Vref3 and non-filtered percent Vref3 is too large. This diagnostic only runs when battery voltage is high enough.	ECM percent Vref3 < or ECM percent Vref3 > or the difference between ECM filtered percent Vref3 and percent Vref3 >	4.875 % Vref3 5.125 % Vref3 0.0495 % Vref3	Diagnostic enabled AND [(Run/Crank voltage for Time period AND Starter engaged) OR (Run/Crank voltage AND Starter engaged)]	= 1 > 6.41 Volts = 0.02 Seconds = FALSE > 8.41 Volts = TRUE	19 / 39 counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference #4 Circuit	P06A3	Detects a continuous or intermittent short on the 5 volt reference circuit #4 by monitoring the reference percent Vref4 and failing the diagnostic when the percent Vref4 is too low or too high or if the delta between the filtered percent Vref4 and non-filtered percent Vref4 is too large. This diagnostic only runs when battery voltage is high enough.	ECM percent Vref4 < or ECM percent Vref4 > or the difference between ECM filtered percent Vref4 and percent Vref4 >	4.875 % Vref4 5.125 % Vref4 0.0495 % Vref4	Diagnostic enabled AND [(Run/Crank voltage for Time period AND Starter engaged) OR (Run/Crank voltage AND Starter engaged)]	= 1 > 6.41 Volts = 0.02 Seconds = FALSE > 8.41 Volts = TRUE	19 / 39 counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Knock Sensor Processor 1 Performance	P06B6	This diagnostic checks for a fault with the internal test circuit (sensor #1) used only for the '20 kHz' method of the Open Circuit Diagnostic. A fault is present when the signal level from the 20 kHz range of the FFT output falls between the Open Test Circuit thresholds.	FFT Diagnostic Output	**> P06B6_P06B7_OpenTestCktThrshMin** **AND** **< P06B6_P06B7_OpenTestCktThrshMax** **See Supporting Tables**	Diagnostic Enabled? Engine Run Time Engine Speed Cumlative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow	Yes ≥ 2.0 seconds > 400 RPM and < 8,500 RPM ≥ 200 Revs ≥ 10 mg/cylinder and ≤ 2,000 mg/cylinder	First Order Lag Filter with Weight Coefficient Weight Coefficient = 0.0100 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Knock Sensor Processor 2 Performance	P06B7	This diagnostic checks for a fault with the internal test circuit (sensor #2) used only for the '20 kHz' method of the Open Circuit Diagnostic. A fault is present when the signal level from the 20 kHz range of the FFT output falls between the Open Test Circuit thresholds.	FFT Diagnostic Output	**> P06B6_P06B7_OpenTestCktThrshMin** **AND** **< P06B6_P06B7_OpenTestCktThrshMax** **See Supporting Tables**	Diagnostic Enabled? Engine Run Time Engine Speed Cumlative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow	Yes ≥ 2.0 seconds > 400 RPM and < 8,500 RPM ≥ 200 Revs ≥ 10 mg/cylinder and ≤ 2,000 mg/cylinder	First Order Lag Filter with Weight Coefficient Weight Coefficient = 0.0100 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Two Stage Oil Pump Control Circuit Open	P06DA	Controller specific output driver circuit diagnoses the two stage oil pump low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Run/Crank Active Cranking State	Enabled ≥ 11.00 = True = False	>= 40 errors out of 50 samples. Performed every 100 msec	Type B, 2 Trips Note: In certain controllers P06DB may also set (Two Stage Oil Pump Control Circuit Short To Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Two Stage Oil Pump Control Circuit Short To Ground	P06DB	Controller specific output driver circuit diagnoses the two stage oil pump low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Run/Crank Active Cranking State	Enabled ≥ 11.00 = True = False	>= 40 errors out of 50 samples. Performed every 100 msec	Type A, 1 Trips Note: In certain controllers P06DA may also set (Two Stage Oil Pump Control Circuit Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Two Stage Oil Pump Control Circuit Short To Power	P06DC	Controller specific output driver circuit diagnoses the two stage oil pump low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Run/Crank Active Cranking State	Enabled ≥ 11.00 = True = False	>= 40 errors out of 50 samples. Performed every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Two Stage Oil Pump Control Circuit Performance - One Sided	P06DD	Diagnoses the two stage oil pump is stuck. This diagnostic includes an intrusive test and a passive test. Intrusive test: The oil pump control is cycled off (high pressure) and on (low pressure) Y = 15 times at calibratable intervals. If a change in oil pressure above a calibration is not detected then the oil pressure is checked to determine if it is stuck. It takes X-out-of-Y failures to fail and set the appropriate code. Passive test: After the intrusive test passes, then a passive test will begin to run. The passive test will monitor the oil pressure changes associated with oil pump control state changes. If the passive test determines that the oil pressure change was less then desired then the intrusive test is retriggered.	<u>Fail from passing state:</u> Oil Pressure delta is less than a minimum delta pressure on a state change and the measured filtered oil pressure is above a threshold	Oil Pressure delta = ABS [Filtered Oil Pressure at beginning of state change - filtered oil pressure after 1.3 seconds] Oil Pressure delta < **P06DD_P06DE_OP_StateChangeMin** AND Filtered Oil Pressure ≥ **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_StateChangeMin** **P06DD_P06DE_MinOilPressThresh**)	<u>Common Criteria:</u> Two Stage Oil Pump is Present Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 10,000 RPM for longer than 30.0 seconds) No active DTC's for diagnsotic enable: Check oil pump TFTKO as a diagnostic enable when Enabled. No active DTC's for control enable: <u>Active Criteria:</u> One Sided Performance Test = Enabled	TRUE ≥ 30.0 seconds ≥ 70.0 kPa FALSE Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA Enabled : OilPmpTFTKO Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA Enabled	≥ 12 errors out of 15 samples. Run once per trip or activiated by the Passive Test	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Oil Pump in Low State	> 1.3 seconds		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Filtered Engine Speed within range	1,400 RPM ≤ Filtered Engine Speed ≤ 2,500 RPM		
					Engine Torque within range	**P06DD_P06DE_MinEnableTorque_OP** ≤ Indicated Requested Engine Torque ≤ **P06DD_P06DE_MaxEnableTorque_OP** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinEnableTorque_OP** **P06DD_P06DE_MaxEnableTorque_OP**)		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 30 RPM		
					Filtered Oil Pressure within range	Filtered Engine Oil Pressure > **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinOilPressThresh**)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Expected Oil Pressure Delta within range	150.0 kPa < ABS[**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 350.0 kPa		
					Passive Criteria:			
					Active Test Passed	TRUE		
					Filtered Engine Speed within range	1,400 RPM ≤ Filtered Engine Speed ≤ 4,000 RPM		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.00 seconds] ≤ 1,000 RPM		
					Oil Pressure Delta within a range	Oil Pressure Delta < **P06DD_P06DE_OP_StateChangeMin** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_StateChangeMin**)		
			Fast Pass Condition Oil Pressure delta is less than a minimum delta pressure on a state	Oil Pressure delta = ABS [Filtered Oil Pressure at beginning	Common Criteria: Two Stage Oil Pump is Present	TRUE	0 errors out of 5 samples. Run once per trip	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			change and the measured filtered oil pressure is above a threshold	of state change - filtered oil pressure after 1.3 seconds] Oil Pressure delta < **P06DD_P06DE_OP_StateChangeMin** AND Filtered Oil Pressure ≥ **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_StateChangeMin** **P06DD_P06DE_MinOilPressThresh**)	Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 10,000 RPM for longer than 30.0 seconds) No active DTC's for diagnsotic enable: Check oil pump TFTKO as a diagnostic enable when Enabled. No active DTC's for control enable: <u>Active Criteria:</u> One Sided Performance Test = Enabled Oil Pump in Low State Modelled Oil Temperature within range	≥ 30.0 seconds ≥ 70.0 kPa FALSE Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA Enabled : OilPmpTFTKO Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA Enabled > 1.3 seconds 40.0 deg C ≤ Oil Temp ≤ 110.0 deg C	or activiated by the Passive Test	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Filtered Engine Speed within range	1,400 RPM ≤ Filtered Engine Speed ≤ 2,500 RPM		
					Engine Torque within range	**P06DD_P06DE_MinEnableTorque_OP** ≤ Indicated Requested Engine Torque ≤ **P06DD_P06DE_MaxEnableTorque_OP** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinEnableTorque_OP** **P06DD_P06DE_MaxEnableTorque_OP**)		
					Expected Oil Pressure Delta within range	150.0 kPa < ABS[**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 350.0 kPa		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 30 RPM		
					Filtered Oil Pressure within range	Filtered Engine Oil Pressure > **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinOilPressThresh**)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Control Module (TCM) Requested MIL Illumination	P0700	Monitors the TCM MIL request message to determine when the TCM has detected a MIL illuminating fault.	Transmission Control Module Emissions-Related DTC set and module is requesting MIL	Transmission Control Module Emissions-Related DTC set and module is requesting MIL		Time since power-up ≥ 3 seconds	Continuous	Type A, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Traction Control Torque Request Circuit	P0856	Determines if torque request from the EBTCM is valid	Serial Communication 2's complement message - ($1C7/$1C9 for engine torque, $1CA/$1C6 for axle torque)	Message <> 2's complement of message	Serial communication to EBTCM (U0108)	No loss of communication	>= 6 failures out of 10 Performed on every received message	Type C, No MIL Safety Special Type C
					Power Mode Engine Running	= Run = True		
					Status of traction in GMLAN message ($4E9)	= Traction Present		
			OR Serial Communication message ($1C7/$1C9 for engine torque, $1CA/$1C6 for axle torque) rolling count index value	Message rolling count value <> previous message rolling count value plus one			6 rolling count failures out of 10 samples Performed on every received message	
			OR Too many minimum limit torque request transitions occur from TRUE to FALSE to TRUE within a time period	Requested torque intervention type toggles from not increasing request to increasing request			>= 3 multi-transitions out of 5 samples. Performed every 200 ms	
			Torque request greater than torque request diagnostic maximum threshold	> 126 Nm for engine torque based traction torque system, OR > 2,053 Nm for axle torque based traction torque system			>= 4 out of 10 samples Performed on every received message	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Temperature Erratic	P100C	This DTC monitors for an erratic Temperature signal via LIN bus from the Battery Monitor Module	Communication of the Temperature signal from the Battery Monitor Module has become erratic or is incorrect for out of total samples	>= 4 counts >= 5 counts	The diagnostic is enabled All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= 1 (1 indicates enabled) >= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Internal Temperature Circuit Erratic	P100D	This DTC monitors for an erratic Temperature Circuit signal via LIN bus from the Battery Monitor Module	Communication of the Temperature Circuit signal from the Battery Monitor Module has become erratic or is incorrect for out of total samples	>= 4 counts >= 5 counts	The diagnostic is enabled All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= 1 (1 indicates enabled) >= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Heater Supply Voltage Sense Circuit Range/ Performance	P103B	The P103B diagnostic determines if the heater supply circuit is rational by comparing the heater supply voltage to the run crank voltage and calculating the difference. The heater supply voltage input is connected to the O2 heater supply circuit inside the vehicle relay center. It is representative of the voltage supplied to the O2 heaters. The O2 heater voltage is used by the HWIO to calculate the O2 heater resistance on switching type O2 sensors (non-WRAF). With a fault set, the resistance calculation is performed with run crank voltage. The diagnostic failure counter is incremented if the voltage difference is greater than the threshold. This DTC is set based on the fail and sample counters.	The absolute value of Heater Supply Voltage delta from Run Crank voltage	> 2.00 volts	Powertrain relay in range Run Crank signal active	= True = True	8 failures out of 10 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Heater Supply Voltage Sense Circuit Low	P103C	The P103C diagnostic determines if the heater supply circuit is low by comparing the heater supply voltage to the threshold. The heater supply voltage input is connected to the O2 heater supply circuit inside the vehicle relay center. It is representative of the voltage supplied to the O2 heaters. The O2 heater voltage is used by the HWIO to calculate the O2 heater resistance on switching type O2 sensors (non-WRAF). With a fault set, the resistance calculation is performed with run crank voltage. The diagnostic failure counter is incremented if the heater supply voltage is less than the threshold. This DTC is set based on the fail and sample counters.	Heater Supply Voltage	< 6.00 volts	Powertrain relay in range Run Crank signal active	= True = True	8 failures out of 10 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Inlet Airflow System Performance (naturally aspirated)	P1101	Detects a performance failure in the Manifold Pressure (MAP) sensor, Throttle Position sensor (TPS) or Mass Air Flow (MAF) sensor that cannot be uniquely identified as a failure in one individual sensor. This diagnostic can set when more than one of these sensors has a performance concern. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from these three sensors. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the system, but no	Filtered Throttle Model Error AND ABS(Measured Flow – Modeled Air Flow) Filtered OR ABS(Measured MAP – MAP Model 1) Filtered AND ABS(Measured MAP – MAP Model 2) Filtered	> 300 kPa*(g/s) > 14.0 grams/sec > 20.0 kPa) > 10.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 0 RPM <= 6,900 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		single failed sensor can uniquely be identified. In this case, the Inlet Airflow System Performance diagnostic will fail.				**P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM**		
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor Not Plausible	P111E	This DTC detects either a biased high or low ECT (Engine Coolant temperature) sensor. This is done by comparing the ECT sensor output to two other temperature sensor outputs after a soak condition.	**Sensor usage definitions:** **Sensor1 =** CeECTR_e_ECT_Snsr (Sensor1 is the temp sensor most impacted by the block heater (if equipped)) **Sensor2 =** CeECTR_e_IAT_Snsr **Sensor3 =** CeECTR_e_OAT_Snsr =================== A failure will be reported if any of the following occur: 1) Sensor1 power up absolute temp difference to Sensor2 and Sensor3 is (Sensor1 fast fail) . 2) Sensor1 power up temp is greater than Sensor2 and Sensor3 in this range: (and a block heater has not been detected) 3) Sensor1 power up temp is lower than Sensor2 and Sensor3 by this amount: 4) Sensor1 power up temp is ≥ Sensor2 and	≥ 50.0 ºC ≥ 15.8 and < 50.0 ºC ≤ 15.8 Deg ºC	No Active DTC's Engine Off Soak Time Propulsion Off Soak Time Non-volatile memory initization Test complete this trip Test aborted this trip Test disabled this trip Ambient LowFuelCondition Diag ================== Block Heater detection is **enabled** when either of the following occurs: 1) Sensor1 power up temp is greater than Sensor2 and Sensor3 in this range: 2) Cranking time ================== Block Heater is **detected**	VehicleSpeedSensor_FA IAT_SensorCircuitFA THMR_RCT_Sensor_Ckt_FA ECT_Sensor_Ckt_FA EngineModeNotRunTimerError EngineModeNotRunTimer_FA OAT_PtEstFiltFA OAT_PtEstRawFA PSAR_PropSysInactveCrs_FA DRER_DiagSystemDsbl > 28,800 seconds > 0 seconds = Not occurred = False = False = False ≥ -7 ºC = False ================== ≥ 15.8 ºC and < 50.0 ºC < 10.0 Seconds ==================	1 failure to set DTC 1 sec/ sample Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Sensor3 by 15.8 ºC and the time spent cranking the engine without starting is ≥ 10.0 seconds with the LowFuelConditionDiag	= False	and diagnostic is aborted when 1) or 2) occurs. 1a) IAT monitoring is enabled after the following Vehicle drive constraints 1b) Drive time 1c) Vehicle speed 1d) Additional Vehicle drive time is provided to 1b when Vehicle speed is below 1c as follows: 1e) IAT drops from power up IAT 2a) ECT monitoring is enabled after engine start in the following engine run time window 2b) Sensor1 temp derivative during the test is: 2c) Consectutive samples of 2b) being true are: ================== Diagnostic is **aborted** when 3) or 4) occurs: 3) Engine run time with vehicle speed below 1b 4) Engine off time (i.e. auto stop) during Block heater detection	> 400 Seconds with > 14.9 MPH and 0.50 times the seconds with vehicle speed below 1b ≥ 8.0 ºC 5.0 <= seconds <= 15.0 < -0.10 ºC/sec ≥ 4 samples =================== ≥ 1,800 Seconds ≥ 180.0 Seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Rail Temperature Sensor Performance	P111F	This DTC Diagnoses Fuel Temperature sensors rationality by comparing Primary sensor (T1) vs. Secondary sensor (T2)	Fuel Temperature Error (Absolute delta between sensor1 and sensor2)	> 20.00 degC	SENT Fuel Temperature Sensor Equiped	True	100.00 failures out of 125.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
					Fuel Temperature Rationality Diagnostic Enabled	True		
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	Temperature sensors 1 out of range Low or High Fault Active (P0182, P0182) Temperature sensors 2 out of range Low or High (P0187, P0188) SENT Communication Fault Active (P16E4, P16E5) SENT Intenal Error Fault Active (P126E, P126F) Fuel Temperature Sensor SENT Message Error Fault Active (P128C, P128D)		
					No Fault Pending on	SENT Communication Fault Pending (P16E4, P16E5) Fuel Temperature Sensor SENT Message Error Fault Pending (P128C, P128D)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 low side circuit shorted to high side circuit	P1248	Controller specific output driver circuit diagnoses injector 1 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	 25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 low side circuit shorted to high side circuit	P1249	Controller specific output driver circuit diagnoses injector 2 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 low side circuit shorted to high side circuit	P124A	Controller specific output driver circuit diagnoses injector 3 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 low side circuit shorted to high side circuit	P124B	Controller specific output driver circuit diagnoses injector 4 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 low side circuit shorted to high side circuit	P124C	Controller specific output driver circuit diagnoses injector 5 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 low side circuit shorted to high side circuit	P124D	Controller specific output driver circuit diagnoses injector 6 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Over Temperature	P1255	To detect if an internal fuel pump driver over-temperature condition exists under normal operating conditions	Fuel Pump Driver Circuit Board temperature (Fuel Pump Driver Overtemperature enumeration)	T>= 160 degC (Fuel Pump Power Module smart device reports Faulted, Not Faulted or Indeterminate)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Diagnostic KeFRPR_b_FPPM_OvertempDiagEnbld c] FPPM Driver Status Alive Rolling Count Sample Faulted d] Diagnostic feedback received e] System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c] <> TRUE d] == TRUE e] 9V < System V < 32V	3 failures / 15 samples 1 sample / 12.5 millisec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Metal Over temperature Active	P1258	The objective of the algorithm is to protect the engine in the event of engine metal overtemperature, mainly due to loss of coolant	Engine Coolant For a period	>= 132 °C >= 2 seconds	Engine Run Time If feature was active and it set the coolant sensor fault then feature will be enabled on coolant sensor fault pending on the next trip.	>= 30 Seconds	Fault present for >= 0 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Temperature Sensor 1 Internal Fault - Error Code	P126E	This DTC Diagnoses the SENT Fuel Temperature Sensor 1 internal failure	Fuel Temperature Sensor 1 SENT digital read value	>= 4,089.00	SENT Fuel Temperature Sensor Equiped	True	50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						True		
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	SENT Communication Fault Active (P16E4, P16E5) Fuel Temperature Sensor SENT Message Error Fault Active (P128C)		
					No Fault Pending on	Fuel Temperature Sensor SENT Message Error Fault Pending (P128C)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Temperature Sensor 2 Internal Fault - Error Code	P126F	This DTC Diagnoses the SENT Fuel Temperature Sensor 2 internal failure	Fuel Temperature Sensor 2 SENT digital read value	>= 4,089.00	SENT Fuel Temperature Sensor Equiped	True	50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						True		
						Enabled when a code clear is not active or not exiting device control		
					No Fault Active on	SENT Communication Fault Active (P16E4, P16E5)		
						Fuel Temperature Sensor SENT Message Error (P128D)		
					No Fault Pending on	Fuel Temperature Sensor SENT Message Error Fault Pending (P128D)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail High Pressure Sensor 2 Out of Range	P127C	This DTC diagnose SENT high pressure sensor 2 that is too low out of range. If the sensor digital value (represnting the refernce voltage) is below the lower digital threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	High Pressure Rail Sensor 2 SENT digital read value	=< 76	SENT High Pressure Sesnor Equiped	True	Engine Sync: 800 failures out of 1,000 samples 3 samples per engine rotaion Time Based: 400 Failuer out of 500 Samples 6.25 ms per Sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure Sensor 1 Internal Performance	P128A	This DTC determines if there is internal error within the SENT pressure sensor 1 (i.e. Broken wire bond internal to the SENT Sensor). Once the internal error is detected a fixed faulted digital values is communicated to the ECU.	Digital pressure sesnor 1 value	>= 4,089		Enabled when a code clear is not active or not exiting device control	Time Based Mode 400 failures out of 500 samples 6.25 ms per Sample Continuous	Type A, 1 Trips
					SENT Fuel Rail Pressure Sensor Internal Performance Enable	True		
					SENT High Pressure Sesnor Equiped	True		
					Not Fault Pending	P16E4 P16E5 P128F		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure Sensor 2 Internal Performance	P128B	This DTC determines if there is internal error within the SENT pressure sensor 2 (i.e. Broken wire bond internal to the SENT Sensor). Once the internal error is detected a fixed faulted digital values is communicated to the ECU.	Digital pressure sesnor 2 value	>= 4,089		Enabled when a code clear is not active or not exiting device control	Time Based Mode 400 failures out of 500 samples 6.25 ms per Sample Continuous	Type A, 1 Trips
					SENT Fuel Rail Pressure Sensor Internal Performance Enable	True		
					SENT High Pressure Sesnor Equiped	True		
					Not Fault Pending	P16E4 P16E5 P128F		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure &Temperature Sensor Temperature 1 Message Incorrect	P128C	This DTC diagnoses the the communication errors on the temperature 1 serial data channel	Serial Message 1 Age	>= 0.03 ms	SENT High Pressure Sesnor Equiped SENT signal Serial waveform diagnostics enable SENT power up delay No Fault Active	True True >= 0.00 seconds P16E4 P16E5	134 failures out of 167 samples 6.5 ms per sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Temperature 2 Message Incorrect	P128D	This DTC diagnoses the the communication errors on the temperature 2 serial data channel	Serial Message 2 Age	>= 0.03 ms	SENT High Pressure Sesnor Equiped SENT signal Serial waveform diagnostics enable SENT power up delay No Fault Active	True True >= 0.00 seconds P16E4 P16E5	134 failures out of 167 samples 6.5 ms per sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Pressure Message Incorrect	P128F	This DTC determines if there is any SENT signal waveform for discrepancies (i.e. too many pulse, too few pulse, clock shift). The SENT HWIO Determines message waveform fault (i.e.too many pulse, too few pulse, clock shift) and if the message age is too long.	SENT HWIO Determines message fault (i.e.too many pulse, too few pulse, clock shift) Message Age	= true > 1.69 ms	SENT High Pressure Sensor Equiped SENT signal Serial waveform diagnostics enable SENT power up delay No Fault Active on	True True >= 0.00 seconds Enabled when a code clear is not active or not exiting device control P16E4 P16E5	400 failures out of 500 samples 6.5 ms per sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Module- Ignition Switch Run/ Start Position Circuit Low [FPPM applications only]	P129D	To detect if the Run/ Start position circuit voltage is short to low / open	FPPM Run_Crank Active status	<> ECM Run_Crank Active status	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Diagnostic KeFRPR_b_FPPM_RunCrnkRatlEnbld c) FPPM Control Status Alive Rolling Count result d) Diagnostic feedback received e) System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == Valid d) == TRUE e) >= 0.0 v	64 failures / 80 samples 1 sample / 12.5 millisec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Signal Message Counter Incorrect	P129E	To detect if the command message received as serial data from the engine control module is valid The "rolling count check" value is created by adding an appended hexadecimal calculation to the pump duty cycle command value. In order to achieve a desired fuel pressure, a hexadecimal equivalent value representing the necessary fuel pump current pulse "On" time (duty cycle as a percent value) is transmitted to the FPPM. The corresponding "check" value is transmitted as well. At the FPPM, the received duty cycle command value is used to create an expected "rolling count" value using the same calculation method as the ECM. The expected "rolling count" value calculated at the receiving power module (smart device) is compared to the transmitted "rolling count" value. If these do not match, a fault condition is reported	FPPM Received Duty Cycle Rolling Count	<> Transmitted Duty Cycle Rolling Count (ECM) (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate test state)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) FPPM Received Duty Cycle Count result d) FPPM Diagnostic feedback received e) CAN communication f) System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == Valid d) == TRUE e) == Valid f) 9v < Sys Voltage > 32v	64 failures / 80 samples 1 sample / 12.5 millisec	Type B, 2 Trips
			FPPM Received Duty Cycle Protection Value	<> Transmitted Duty Cycle Protection Value (ECM) (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate test state)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) FPPM Received Duty Cycle Protection Value result d) FPPM Diagnostic feedback received e) CAN communication f) System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == Valid d) == TRUE e) == Valid f) 9v < Sys Voltage > 32v	64 failures / 80 samples 1 sample / 12.5 millisec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		forward to the ECM where X/Y diagnostic counting is performed.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Enable Circuit Performance	P12A6	The purpose of the Fuel Pump Driver Control Module Enable Circuit Performance Diagnostic is to detect if the state of the fuel control enable circuit is valid. This is accomplished by comparing the fuel control enable state [high or low] reported by the Fuel Pump Driver Control Module to the expected state of the fuel control enable signal in the ECM [in software]. When the reported state does not match the expected state, the fail counter increments.	FPPM Fuel Control Enable Active boolean	<> Fuel Control Enable variable (ECM)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Diagnostic KeFRPR_b_FPPM_FuelCntrlEnblEnbld c) FPPM Control Data Rolling Count result d) Diagnostic feedback received e) System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == Valid d) == TRUE e) >= 9.0 v	40 failures / 80 samples 1 sample / 12.5 millisec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Control Status Signal Message Counter Incorrect	P12A8	To detect if the control status message transmitted as serial data from the driver control module is valid. The "rolling count check" value is created by adding an appended hexadecimal calculation to each control command value. The corresponding "check" value is transmitted to the FPPM as well as the actual command. At the FPPM, the received command value is used to create an expected "rolling count" value using the same calculation method as the ECM. The expected "rolling count" value calculated at the receiving power module (smart device) is compared to the transmitted "rolling count" value. If these do not match, a fault condition is reported forward to the ECM where X/Y diagnostic counting is performed.	FPPM Control Status Alive Rolling Count	<> ECM Control Status Alive Rolling Count (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate test state)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) FPPM Diagnostic feedback received	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == TRUE	64 failures / 80 samples 1 sample / 12.5 millisec	Type B, 2 Trips
			FPPM Power Consumption Alive Rolling Count	<> ECM Power Consumption Alive Rolling Count (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate test state)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) FPPM Diagnostic feedback received	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == TRUE	64 failures / 80 samples 1 sample / 12.5 millisec	
			FPPM Driver Status Alive Rolling Count	<> ECM Driver Status Alive Rolling Count (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate test state)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) FPPM Diagnostic feedback received	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == TRUE	64 failures / 80 samples 1 sample / 12.5 millisec	
			FPPM Hardware Status Alive Rolling Count	<> ECM Hardware Status Alive Rolling Count (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate test state)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) FPPM Diagnostic feedback received	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == TRUE	64 failures / 80 samples 1 sample / 12.5 millisec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Coil Positive Voltage Circuit Group 1 * * SIDI ONLY * *	P135A	This diagnostic checks for minimum voltage at the fuse which supplies power to the Ignition Coils (applicable only for SIDI applications). A diagnostic failure indicates a blown fuse.	Ignition Module Supply Voltage.	< 2.5 Volts	Diagnostic Enabled?	Yes	24 Failures out of 30 Samples 6.25 msec rate	Type A, 1 Trips
					Three possible Ignition Coil Power Sources (only 1 used):			
					Ignition Coil Power Source =	PT Relay (Case 3)		
					Case 1: Battery Delay starting at Key-On	5 Engine Revs		
					Case 2: Ignition Run/ Crank Ignition Run/Crank Voltage	> 5.0 volts		
					Case 3: PT Relay PT Relay Voltage	> 11.0 volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Coil Positive Voltage Circuit Group 2 * * SIDI ONLY * *	P135B	This diagnostic checks for minimum voltage at the fuse which supplies power to the Ignition Coils (applicable only for SIDI applications). A diagnostic failure indicates a blown fuse.	Ignition Module Supply Voltage.	< 2.5 Volts	Diagnostic Enabled?	Yes	24 Failures out of 30 Samples 6.25 msec rate	Type: Type A, 1 Trips
					Three possible Ignition Coil Power Sources (only 1 used):			
					Ignition Coil Power Source =	PT Relay (Case 3)		
					Case 1: Battery Delay starting at Key-On	5 Engine Revs		
					Case 2: Ignition Run/ Crank Ignition Run/Crank Voltage	> 5.0 volts		
					Case 3: PT Relay PT Relay Voltage	> 11.0 volts		

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 power from exhaust flow and thermal energy resulting from elevated idle speed and retarded spark advance. Detects if the cold start emission reduction system has failed resulting in the delivered power being out of range.	Average desired accumulated exhaust power - Average actual accumulated exhaust power (too much energy delivered to catalyst) Average desired accumulated exhaust power - Average actual accumulated exhaust power (too little energy delivered to catalyst) (EWMA filtered) Average Power = output of **P1400_EngineSpeedResidual_Table** * output of **P1400_SparkResidual_Table** NOTE: Desired accumulated power would use the desired catalyst light off spark and desired engine speed and the actual accumuated power would use the final commanded spark and actual engine speed. Refer to the Supporting Tables for details	< -32.00 KJ/s (high RPM failure mode) > 5.31 KJ/s (low RPM failure mode)	To enable the diagnostic, the Cold Start Emission Reduction Strategy must be Active per the following: Catalyst Temperature AND Engine Coolant AND Engine Coolant AND Barometric Pressure The Cold Start Emission Reduction strategy must not be exiting. The strategy will exit per the following: Catalyst Temperature AND Engine Run Time OR Engine Run Time OR Barometric Pressure	< 350.00 degC > -10.00 degC <= 56.00 degC >= 72.00 KPa >= 900.00 degC >= 19.00 seconds > **P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit** This Extended Engine run time exit is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details. < 72.00 KPa	Runs once per trip when the cold start emission reduction strategy is active Frequency: 100ms Loop Test completes after 10 seconds of accumulated qualified data.	EWMA Based - Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Other Enable Criteria:			
					OBD Manufacturer Enable Counter	0		
					Vehicle Speed	< 1.24 MPH		
					Allow diagnostic to calculate residual in an off-idle state. If the value of the OffIdleEnable is equal to 1 then the "DriverOffAccelPedal" will not be checked. However, if the value of OffIdleEnable is 0 then driver must be off the accel pedal	0 (A value of 1 allows diagnostic to run and calculate the residual while off idle. A value of 0 requires calculation of the residual at idle)		
					A change in throttle position (tip-in/tip-out) will initiate a delay in the calculation of the average qualified residual value. Therefore when the:			
					Pedal Close Delay Timer	> 5.00 seconds		
					the diagnostic will continue the calculation.			
					A change in gear will initiate a delay in the calculation of the average qualified residual value to			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					allow time for the actual engine speed and actual final commanded spark to achieve their desired values. Therefore, when the:			
					Gear Shift Delay Timer	> 2.00 seconds		
					the diagnostic will continue the calculation			
					For Manual Transmission vehicles:			
					Clutch Pedal Position	> 5.00 %		
					Clutch Pedal Position	< 5.00 %		
					The diagnostic will delay calculation of the residual value and potentially weight the residual calculation differently based on engine run time. This is to ensure the diagnostic is operating in idle speed control as well as during the peak catalyst light off period.			
					The time weighting factor must be :	> 0 These are scalar values that are a function of engine run time. Refer to		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P1400_ColdStartDiagnosticDelayBasedOnEngineRunTime and the cal axis, **P1400_ColdStartDiagnosticDelayBasedOnEngineRunTimeCalAxis** in the "Supporting Tables" for details.		
					General Enable:			
					DTC's Not Set:	AcceleratorPedalFailure ECT_Sensor_FA IAT_SensorCircuitFA MnfdTempSensorCktFP CrankSensor_FA FuelInjectorCircuit_FA MAF_SensorFA MAP_SensorFA EngineMisfireDetected_FA ClutchPstnSnsr FA IAC_SystemRPM_FA IgnitionOutputDriver_FA TPS_FA VehicleSpeedSensor_FA 5VoltReferenceMAP_OOR_Flt TransmissionEngagedState_FA EngineTorqueEstInaccurate		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Engine Speed Request Circuit	P150C	This DTC monitors for an error in communication with the Transmission Engine Speed Request signal in $19D	Communication of the Alive Rolling Count or Protection Value in the Transmission Engine Speed signal over CAN bus is incorrect for out of total samples	>= 10 counts >= 10 counts	All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	>= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 25ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Steady State Actuation Fault	P1516	Detect an inablity to maintain a steady state throttle position.	The absolute difference between desired and indicated throttle position is >	2.00 percent	Run/Crank voltage	> 6.41 Volts	0.49 ms	Type B, 2 Trips
					TPS minimum learn is not active AND Throttle is being Controlled			
					Throttle is considered in a steady state condition when the desired throttle position over a 12.5 ms period is	< 0.25 percent		
					For a settling time period	> 4.00 seconds		
					Ignition voltage failure is false	P1682		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Adaptive Cruise Control Signal Circuit	P1553	Detects rolling count or protection value errors in Adaptive Cruise Control Axle Torque Command serial data signal	If x of y rolling count / protection value faults occur, disable adaptive cruise control for duration of fault		Adaptive Cruise Control Command Serial Data Error Diagnostic Enable	1.00	9 / 17 counts	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Switch State Undertermin ed	P155A	Detects when cruise switch state cannot be determined, such as low voltage conditions	cruise switch state is received as "undetermined" for greater than a calibratable time	fail continuously for greater than 3.0 seconds			fail continuously for greater than 3.0 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Set/ Coast Signal 2 Circuit	P155B	Detects a failure of the cruise set 2 switch in a continously applied state	Cruise Control Set 2 switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 89.000 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 89.000 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Resume/ Acceleration Signal 2 Circuit	P155C	Detects a failure of the cruise resume 2 switch in a continously applied state	Cruise Control Resume 2 switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 89.000 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 89.000 seconds	MIL: Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Signal Message Counter Incorrect	P155E	This DTC monitors for an error in communication with the DC/DC Converter Actuator Voltage Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for	>= 8 counts	All the following conditions are met for	>= 3.00 seconds	Executes in 10ms loop.	Type B, 2 Trips
					Power Mode	= Run		
					Powertrain Relay Voltage	>= 11.00 Volts		
			out of total samples	>= 10 counts	Run/Crank Ignition Voltage	>= 11.00 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Performance Signal Message Counter Incorrect	P155F	This DTC monitors for an error in communication with the DC/DC Converter Internal Health Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	>= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 25ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Ignition Switch Run/ Start Position Signal Message Counter Incorrect	P156D	This DTC monitors for an error in communication with the DC/DC Converter Run/ Crank Terminal Status Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	>= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Crank Control Signal Message Counter Incorrect	P156E	This DTC monitors for an error in communication with the DC/DC Converter Crank Control Terminal Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	>= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Calibration Incorrect	P158A	Type of cruise in Body Control Module does not match that in the Engine Control Module for 2.5 seconds	Type of cruise system in GMLAN $4E9 does not match with that in the Engine Control Module for a fix time.	2.5 seconds	DID $40 from BCM says cruise system is present (ECM recieves programmble information from Body Control Module) OR ECM will not receive Programmable information for Cruise from Body Control Module	True	fail continuously for greater than 2.5 seconds.	Type C, No MIL Special Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Analog Mode Switch Circuit Low	P159F	This DTC will detect an analog mode switch input that is too low out of range.	For button type Normal_Button Analog Mode Switch low voltage threshold % of 5V range For button type Enhanced_Button Analog Mode Switch low voltage threshold % of 5V range For button type Mulitple_Button Analog Mode Switch low voltage threshold % of 5V range	< 29.00 % < 24.30 % < 21.20 %	Vehicle mode analog switch button type	= CeDMDG_e_Normal_Button	200 failures out of 250 samples 25 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Analog Mode Switch Circuit High	P15A0	This DTC will detect an analog mode switch input that is too high out of range.	For button type Normal_Button Analog Mode Switch high voltage threshold % of 5V range For button type Enhanced_Button Analog Mode Switch high voltage threshold % of 5V range For button type Mulitple_Button Analog Mode Switch high voltage threshold % of 5V range	>= 88.80 % >= 94.10 % >= 95.30 %	Vehicle mode analog switch button type	= CeDMDG_e_Normal_Button	200 failures out of 250 samples 25 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Analog Mode Switch Performance	P15A1	This DTC will detect an analog mode switch input that is in an indeterminate range.	For button type Normal_Button Analog Mode Switch indeterminate region % of 5V range For button type Enhanced_Button Analog Mode Switch indeterminate regions % of 5V range For button type Mulitple_Button Analog Mode Switch indeterminate regions % of 5V range	66.80 % ≤ % of 5 volts < 72.80 % 63.50 % ≤ % of 5 volts < 65.50 % 83.50 % ≤ % of 5 volts < 85.50 % 52.90 % ≤ % of 5 volts < 54.10 % 74.10 % ≤ % of 5 volts < 75.30 % 87.50 % ≤ % of 5 volts < 88.60 %	Vehicle mode analog switch button type	= CeDMDG_e_Normal_Button	200 failures out of 250 samples 25 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Front Object Detection Control Module Torque Request Signal Message Counter Incorrect	P15F6	Detects rolling count or protection value errors in Collision Preparation System Axle Torque Command serial data signal	If x of y rolling count / protection value faults occur, disable collision preparation system for duration of fault		Front Object Detection Module Torque Request Serial Data Error Diagnostic Enable	1.00	4 / 10 counts	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Automatic Braking Engine Torque Request Signal Message Incorrect	P15F8	Detects rolling count or protection value errors Rear Virtual Bumper Axle Torque Command serial data signal	If x of y rolling count / protection value faults occur, disable rear virtual bumper or collision preparation system for duration of fault		Automatic Braking Engine Torque Request Serial Data Error Diagnostic Enable	1.00	4 / 10 counts	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Sensor Signal Message Counter Incorrect	P15FF	This DTC monitors for an internal error or error in communication with the Battery Monitor Signal	Communication of the Alive Rolling Count from the Battery Monitor Module over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for out of total samples	 >= 8 counts >= 10 counts	All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	>= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	Fastest periodic communication rate to Battery Monitor Module on LIN bus executes at 250ms.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module SIDI High Pressure Pump current monitor	P163A	This DTC Diagnoses the current from the control area and compares it with calibrated thresholds to set current high and low flags	SIDI fuel pump High Current Test Current SIDI fuel pump Low Current Test Current	 >= 3.00 Amps <= 0.10 Amps	Battery Voltage Low Side Fuel Pressure Engine Run Time Additional Enable Conditions: All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is false and Device control pump ckt enabled on is false andEngine movement	>= 11 Volts > 0.275 MPa >= **P0089 - P163A - P228C - P228D - P0191 - Engine run time threshold to Enable Diagnostic** (see supporting tables) Enabled when a code clear is not active or not exiting device control Engine is not cranking	Current High/ Low 10 seconds failures out of 12.50 seconds sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					detected is true and Manufacturers enable counter is 0) Flex Fuel Sensor Not FA Ignition voltage out of correlation error(P1682) not active and Barometric Pressure Inlet Air Temp Fuel Temp	 >= 70.0 KPA >= -10.0 degC -10 <= Temp degC <= 127		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Voltage Correlation	P1682	Detect a continuous or intermittent out of correlation between the Run/Crank Ignition Voltage and the Powertrain Relay Ignition Voltage. The diagnostic monitors the difference in voltage between Run/Crank Voltage and the Powertrain Relay Ignition Voltage and fails the diagnostic when the voltage difference is too high. This diagnostic only runs when the powertrain is commanded on and the Run/Crank Voltage is greater than a threshold based on IAT or the powertrain ignition voltage is high enough the Run/Crank voltage is high enough.	|Run/Crank – PT Relay Ignition| >	3.00 Volts		Powertrain commanded on AND (Run/Crank voltage > Table, f(IAT). See supporting tables: **P1682_PT Relay Pull-in Run/Crank Voltage f(IAT)** OR PT Relay Ignition voltage > 5.50 Volts) AND Run/Crank voltage > 5.50 Volts	240 / 480 counts or 0.175 sec continuous; 12.5 ms/count in main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS SENT Comm Circuit Low (Gasoline applications ONLY)	P16A0	Detects a continuous or intermittent short low or open fault in the TPS SENT Communication Circuit by monitoring the voltage and failing the diagnostic when the voltage for the wave pulse is below state threshold as defined by SAE J2716 SENT Protocol. This diagnostic only runs when battery voltage is high enough.	Voltage for wave pulse is below state threshold as defined by SAE J2716 SENT Protocol	0.5 V	Run/Crank voltage	> 6.41 Volts	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS SENT Comm Circuit High (Gasoline applications ONLY)	P16A1	Detects a continuous or intermittent short high fault in the TPS SENT Communication Circuit by monitoring the voltage and failing the diagnostic when the voltage for the wave pulse is above state threshold as defined by SAE J2716 SENT Protocol. This diagnostic only runs when battery voltage is high enough. Detects a High Circuit Fault in the TPS SENT Communication Circuit	Voltage for wave pulse is above state threshold as defined by SAE J2716 SENT Protocol	4.1 V	Run/Crank voltage	> 6.41 Volts	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
TPS SENT Comm Circuit Performance (Gasoline applications ONLY)	P16A2	Detects a message fault in the TPS SENT Communication Circuit by monitoring the message pulse time and failing the diagnostic when the time for the pulse is above a low time threshold or above a high time threshold or if the message age limit is greater than a time threshold. This diagnostic only runs when battery voltage is high enough. Detects a Message Fault in the TPS SENT Communication Circuit	Message Pulse < Message Pulse > or Message Age Limit >= or Signal CRC fails	0.125977 ms 0.209991 ms 3.125 ms	Run/Crank voltage	> 6.41 Volts	79 / 159 counts; 57 counts continuous; 3.125 ms /count in the ECM main processor	Type A, 1 Trips

<table>
<tr><th>Component/ System</th><th>Fault Code</th><th>Monitor Strategy Description</th><th>Malfunction Criteria</th><th>Threshold Value</th><th>Secondary Parameters</th><th>Enable Conditions</th><th>Time Required</th><th>MIL Illum.</th></tr>
<tr><td>Ignition Voltage Correlation #2</td><td>P16A7</td><td>Detect a continuous or intermittent out of correlation between the Run/Crank Ignition Voltage and the Powertrain Relay Ignition Voltage #2. The diagnostic monitors the difference in voltage between Run/Crank Voltage and the Powertrain Relay Ignition Voltage and fails the diagnostic when the voltage difference is too high. This diagnostic only runs when the powertrain is commanded on and the Run/Crank Voltage is greater than a threshold based on IAT or the powertrain ignition voltage is high enough the Run/Crank voltage is high enough. Detect a continuous or intermittent out of correlation between the Run/Crank Ignition Voltage & the Powertrain Relay Ignition Voltage #2.</td><td>|Run/Crank – PT Relay Ignition| ></td><td>3.00 Volts</td><td></td><td>Powertrain commanded on

AND

(Run/Crank voltage > Table, f(IAT). See supporting tables: P1682_PT Relay Pull-in Run/Crank Voltage f(IAT)

OR PT Relay Ignition voltage > 5.50 Volts)

AND

Run/Crank voltage > 5.50 Volts</td><td>240 / 480 counts or 0.175 sec continuous; 12.5 ms/count in main processor</td><td>Type A, 1 Trips</td></tr>
</table>

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Controls Ignition Relay Feedback Circuit 2 High Voltage - (GEN III Controllers ONLY)	P16B3	Detects high voltage in the engine controls ignition relay feedback circuit 2. This diagnostic reports the DTC when high voltage is present. Monitoring occurs when the relay state is inactive.	Engine controls ignition relay feedback circuit 2 high voltage	Relay voltage >= 4.00	Powertrain relay high diag enable Powertrain relay state	= 1.00 = INACTIVE	50 failures out of 63 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Circuit Low Voltage	P16D4	This DTC monitors for a battery module low voltage circuit fault	Battery Module signals a low voltage circuit fault via LIN bus VeVITR_U_12VBattVolt	< 3.00 Volts for 200 fail counts out of 250 sample counts	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Circuit High Voltage	P16D5	This DTC monitors for a battery module high voltage circuit fault	Battery Module signals a high voltage circuit fault via LIN bus VeVITR_U_12VBattVolt	> 26.00 Volts for 200 fail counts out of 250 sample counts	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Current Low	P16D6	This DTC monitors for a battery module current low fault	Battery Module signals a current low fault via LIN bus VeVITR_I_12VBattCurrRaw	< -1400 Amps for 200 fail counts out of 250 sample counts	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Module Monitor Timer Performance	P16DC	This DTC monitors for a battery module timer performance fault	Battery Module shall fail when either of the following criteria are met. Case 1: Wake Up Test A: LIN Bus Off Timer / 1,800.00 seconds or B: (LIN Bus Off Timer + 1,800.00 seconds) / 1,800.00 seconds or C: (LIN Bus Off Timer - 1,800.00 seconds) / 1,800.00 seconds Case 2: Sequential Test Sequential Test is enabled	If the calculated wakeup value is smaller than 24.00 counts, then the smaller value will be outputed. If the calculated wakeup value is greater than 24.00 counts, then the calibration itself is outputed. If any outputs above are not not equal to the IBS maximum down counter counts, the diagnostic fails. This portion of the diagnostic is not used. = 0 (1 indicates enabled)	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit Historical Temperature Data Trigger Request Module Off Timer Fault Active Run Crank Low Timer Error Code Clear Request IBS Measure Temperaure Data Available	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True = 1 (initializes to 0 then transitions to 1 once data is available- NEED TO SEE POSITIVE RISING EDGE) = False = False = False (latched when set True) = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TPTKO OR TFTKO	= False (when KeVITD_b_TimerPerf_DFIRDisable = 0) Calibration is set to 0		
					IBS Down Counter Value	Not equal to 25.00		
					Spurious Reset	= False		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Current High	P16DD	This DTC monitors for a battery module current high fault	Battery Module signals a current high fault via LIN bus VeVITR_I_12VBattCurrRaw	> +1400 Amps for 200 fail counts out of 250 sample counts	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Internal Temperature Circuit Low	P16DE	This DTC monitors for a battery module internal temperature circuit low fault	Battery Module raw temperature 1 value	> 120.00 Celsius	The historical mode diagnostic is enabled and / or The continuous mode diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit For Historical Mode IBS Down Counter (over LIN bus) For Continuous Mode IBS Down Counter (over LIN bus) IBS Measure Temperature Data Available over LIN bus	= 1 (1 indicates enabled) = 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True Between 1 and 24 or zero = zero = True	4 failed samples within 5 total samples Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Internal Temperature Circuit High	P16DF	This DTC monitors for a battery module internal temperature circuit high fault	Battery Module raw temperature 1 value	< -43.00 Celsius	The historical mode diagnostic is enabled and / or The continuous mode diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit For Historical Mode IBS Down Counter (over LIN bus) For Continuous Mode IBS Down Counter (over LIN bus) IBS Measure Temperature Data Available over LIN bus	= 1 (1 indicates enabled) = 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True Between 1 and 24 = zero = True	4 failed samples within 5 total samples Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Random Access Memory (RAM) Error	P16E1	This DTC monitors for a battery module RAM memory fault	Battery Module signals a RAM memory fault via LIN bus VeVITR_e_IBS_IntRAM_ Fault	= CeVITR_e_DiagFailed	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Read Only Memory (ROM) Error	P16E2	This DTC monitors for a battery module ROM memory fault	Battery Module signals a ROM memory fault via LIN bus VeVITR_e_IBS_IntROM_ Fault	= CeVITR_e_DiagFailed	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Data Incompatible	P16E3	This DTC monitors for a battery module data incompatible fault	Battery Module data received over LIN bus is incompatible. (Measured by any of the following)		The historical mode diagnostic is enabled and / or	= 1 (1 indicates enabled)	Diagnostic runs in the 250 ms loop	Type B, 2 Trips
					The continuous mode diagnostic is enabled	= 1 (1 indicates enabled)		
			Historical Test	Upon IBS wakeup, if any of the below Historical Test conditions are satisfied, the diagnostic fails.	System Diagnostics Disabled	= False		
					Power Mode	Not equal off		
					12V System Reference Voltage	> 9.00 Volts		
			Absolute value of IBS battery capacity C20 data (IBS Return Nominal C20 - 80.00 Ah)	> 5.00 Ah	LIN Bus Off or Battery Module Communication Faults Active	= False		
			or					
					Outside Air Temperature	> -20.00 Celsius and < 50.00 Celsius		
			IBS Returns a battery type that is not equal to	CeBSER_e_IBS_Cfg BatAGM				
			or		Outside Air Temperature Validity Bit	= True		
			Absolute value of (IBS Return Battery Calibration#1 U40@25 C - 12.11 V)	> 0.50 Volts	IBS Configuration Data Available over LIN bus	= True		
			or		Historical Test Only Host Controller MEC Counter	<= 0		
			Absolute value of (IBS Return Battery Calibration#1 U80@25 C - 12.65 V)	> 0.50 Volts				
			Continuous Test	If any of the below conditions are satisfied				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				for 16.00 fail counts out of 20.00 sample counts, the diagnostic fails.				
			Absolute value of IBS battery capacity C20 data (IBS Return Nominal C20 - 80.00 Ah)	> 5.00 Ah				
			or					
			IBS Returns a battery type that is not equal to	CeBSER_e_IBS_Cfg BatAGM				
			or					
			Absolute value of (IBS Return Battery Calibration#1 U40@25 C - 12.11 V)	> 0.50 Volts				
			or					
			Absolute value of (IBS Return Battery Calibration#1 U80@25 C - 12.65 V)	> 0.50 Volts				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Communication Circuit 3 Low Voltage	P16E4	This DTC determines if the SENT signal shorted low, this is determined by monitoring the number pulses on the SENT signal line received at the ECU and the SENT Signal Line State always indicating low.	The number pulses on the SENT signal line SENT Signal Line State	<= 40 = Low	SENT High Pressure Sensor Equiped SENT Sensor Communication Circuit Diagnostic Enabled SENT power up delay	True True >= 0.00 seconds Enabled when a code clear is not active or not exiting device control	400 failures out of 500 samples 6.5 ms per sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Communication Circuit 3 High Voltage	P16E5	This DTC determines if the SENT signal shorted low, this is determined by monitoring the number pulses on the SENT signal line received at the ECU and the SENT Signal Line State always indicating high.	The number pulses on the SENT signal line SENT Signal Line State	<= 40 = High	SENT High Pressure Sensor Equiped SENT Sensor Communication Circuit Diagnostic Enabled SENT power up delay	True True >= 0.00 seconds Enabled when a code clear is not active or not exiting device control	400 failures out of 500 samples 6.5 ms per sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Serial Peripheral Interface Bus 1	P16F0	This DTC detects intermitent and continuous invalid SPI messages. This is based on the detection of missing or invalid receive message within the main processor before receiving a valid message.	This function detects a serial communications fault based upon the detection of missing or invalid (receive) message within the main processor before receiving a valid message.		Run/Crank voltage	> 6.41 Volts	39 / 399 counts continuous; 12.5 ms /count in the ECM main processor	Type A, 1 Trips
			This function detects a serial communications fault based upon the detection of missing or invalid (receive) message within the main processor after receiving a valid message.		Run/Crank voltage	> 6.41 Volts	159 / 399 counts continuous; 12.5 ms /count in the ECM main processor	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Redundant Memory Performance (Gasoline applications ONLY)	P16F3	Detect Processor Calculation faults due to RAM corruptions, ALU failures and ROM failures For all of the following cases: If the individual diagnostic threshold is equal to 2048 ms, this individual case is not applicable. If any of the following cases are X out of Y diagnostics and the fail (x) is greater than the sample (Y), this individual case is also not applicable.	Equivance Ratio torque compensation exceeds threshold	-66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	Type A, 1 Trips
			Absolute difference between Equivance Ratio torque compensation and its dual store out of bounds given by threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of Accessory torque and its redundant calculation is out of bounds given by threshold range	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Absolute difference of Filtered Air-per-cylinder and its redundant calculation is out of bounds given by threshold range	61.60 mg	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference between the previous Final Advance and the current Final Advance not Adjusted for Equivalence Ratio is out of bounds given by threshold range	15.00 degrees		Engine speed >0rpm	Up/down timer 425 ms continuous, 0.5 down time multipier	
			Torque Learn offset is out of bounds given by threshold range	High Threshold 0.00 Nm Low Threshold 0.00	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				Nm				
			One step ahead calculation of air-per-cylinder and two step ahead is greater than threshold	80.00 mg		Engine speed > 600 rpm	Up/down timer 454 ms continuous, 0.5 down time multipier	
			Difference between Unmanaged Spark and PACS Spark is greater than threshold	15.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Commanded Predicted Engine Torque and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Zero pedal axle torque is out of bounds given by threshold range	High Threshold 1,085.57 Nm Low Threshold -65,535.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Creep Coast Axle Torque is out of bounds given by threshold range	High Threshold 1,085.57 Nm Low Threshold -65,535.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Absolute difference of Friction torque and its redundant calculation is out of bounds given by threshold range	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Arbitrated Air-Per-Cylinder filter coefficient is out of bounds given by threshold range	High Threshold 1.000 Low Threshold 0.074	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Launch spark is active but the launch spark redundant path indicates it should not be active	N/A		Engine speed < 8,191.88 or 8,191.88 rpm (hysteresis pair)	Up/down timer 154 ms continuous, 0.5 down time multipier	
			Rate limited vehicle speed and its dual store do not equal	N/A		Time since first CAN message with vehicle speed >= 0.500 sec	10 / 20 counts; 25.0msec/count	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Commanded engine torque due to fast actuators and its dual store do not equal	N/A	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Commanded engine torque due to slow actuators and its dual store do not equal	N/A	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			TOS to wheel speed conversion factor is out of bounds given by threshold range	High Threshold: 1.10 T/C Range Hi 0.10 T/C Range Lo Low Threshold: 1.10 T/C Range Hi 0.10 T/C Range Lo	Ignition State	Accessory, run or crank	255 / 6 counts; 25.0msec/count	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Cylinders active greater than commanded	2 cylinders		Engine run flag = TRUE > 2.00 s Number of cylinder events since engine run > 24 No fuel injector faults active	Up/down timer 454 ms continuous, 0.5 down time multipier	
			Transfer case neutral request from four wheel drive logic does not match with operating conditions	N/A	Ignition State	Accessory, run or crank Transfer case range valid and not over-ridden FWD Apps only	7.00 / 10.00 counts; 25.0msec/count	
			Driver progression mode and its dual store do not equal	N/A	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							multipier	
			Predicted torque for uncorrected zero pedal determination is greater than calculated limit.	Table, f(Engine, Oil Temp). **P16F3_Speed Control External Load f(Oil Temp, RPM)** + 66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Engine Predicted Request Without Motor is greater than its redundant calculation plus threshold	65.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Engine Immediate Request Without Motor is greater than its redundant calculation plus threshold	65.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							down time multipier	
			Positive Torque Offset is greater than its redundant calculation plus threshold OR Positive Torque Offset is less than its redundant calculation minus threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Commanded Predicted Engine Request is greater than its redundant calculation plus threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, down time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							multipier 0.5	
			Commanded Hybrid Predicted Crankshaft Request is greater than its redundant calculation plus threshold	4,096.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Commanded Hybrid Immediate Crankshaft Request is less than its redundant calculation minus threshold	4,096.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Regeneration Brake Assist is not within a specified range	Brake Regen Assist < 0 Nm or Brake Regen Assist > 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Cylinder Spark Delta Correction exceeds the absolute difference as compared to Unadjusted Cylinder Spark Delta	15.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			1. Cylinder Torque Offset exceeds step size threshold OR	1. 66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			2. Sum of Cylinder Torque Offset exceeds sum threshold	2. 66.62 Nm				
			Engine Capacity Minimum Immediate Without Motor is greater than its dual store plus threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Engine Capacity Minimum Engine Off is greater than threshold	0 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine Capacity Minimum Engine Immediate Without Motor is greater than threshold	0 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Commanded Immediate Engine Request is greater than its redundant calculation plus threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Engine Speed Lores Intake Firing (event based) calculation does not equal its redundant calculation	N/A		Engine speed greater than 0rpm	Up/down timer 154 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine Speed Lores Intake Firing timing (event based) calculation does not equal its redundant calculation	N/A		Engine speed greater than 0rpm	Up/down timer 154 ms continuous, 0.5 down time multipier	
			Idle speed control calculated predicted minimum torque request exceeds calculated torque limit	Table, f(Oil Temp, RPM). See supporting tables: **P16F3_Speed Control External Load f(Oil Temp, RPM)** + 66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Idle speed control calculated predicted minimum torque without reserves exceeds calculated torque limit	Table, f(Oil Temp, RPM). See supporting tables: **P16F3_Speed Control External Load f(Oil Temp, RPM)** +	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				66.62 Nm				
			Difference between Driver Requested Immediate Torque primary path and its secondary exceeds threshold	1,085.57 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Driver Immediate Request is less than its redundant calculation minus threshold	1,085.57 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Commanded Immediate Request is greater than its redundant calculation plus threshold	1,085.57 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR Commanded Immediate Request is less than its redundant calculation minus threshold				multipier	
			Commanded Immediate Response Type is set to Inactive	N/A	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Difference between Cruise Axle Torque Arbitrated Request and Cruise Axle Torque Request exceeds threshold	135.70 Nm		Cruise has been engaged for more than 4.00 seconds	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Desired engine torque request greater than redundant calculation plus threshold	65.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Engine min capacity above threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 88 ms continuous, 0.5 down time multipier	
			No fast unmanaged retarded spark above the applied spark plus the threshold	Table, f(RPM,APC). See supporting tables: **P16F3_Delta Spark Threshold f (RPM,APC)**		Engine speed greater than 0rpm	Up/down timer 425 ms continuous, 0.5 down time multipier	
			Absolute difference of adjustment factor based on temperature and its dual store above threshold	2.76 m/s	Ignition State	Accessory, run or crank	Up/down timer 121 ms continuous, 0.5 down time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							multipier	
			1. Absolute difference of redundant calculated engine speed above threshold	500 RPM		Engine speed greater than 0 RPM	Up/down timer 154 ms continuous, 0.5 down time multipier	
			After throttle blade pressure and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Speed Control's Preditcted Torque Request and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine oil temperature and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 288 ms continuous, 0.5 down time multipier	
			Desired throttle position greater than redundant calculation plus threshold	6.08 percent	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of the rate limited pre-throttle pressure and its redundant calculation greater than threshold	0.06 kpa	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Throttle desired torque above desired torque plus threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Desired filtered throttle torque exceeds the threshold plus the higher of desired throttle torque or modeled throttle torque	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Torque feedback proportional term is out of allowable range or its dual store copy does not match	High Threshold 33.31 Nm Low Threshold -33.31 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Torque feedback integral term magnitude or rate of	High Threshold	Ignition State	Accessory, run or crank	Up/down timer 475	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			change is out of allowable range or its dual store copy do not match	62.45 Nm Low Threshold -66.62 Nm Rate of change threshold 4.16 Nm/loop			ms continuous, 0.5 down time multipier	
			Difference of Final Torque feedback proportional plus integral term and its redundant calculation is out of bounds given by threshold range	High Threshold 66.62 Nm Low Threshold - 66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Difference of torque desired throttle area and its redundant calculation is out of bounds given by threshold range	High Threshold 0.50 % Low Threshold - 0.50 %	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Difference of torque model coefficients and its redundant calculation is out of bounds given by threshold range	High Threshold 0.0001318 Low Threshold - 0.0001318	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Difference of base friction torque and its redundant calculation is out of bounds given by threshold range	High Threshold 66.62 Nm Low Threshold - 66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Accessory drive friction torque is out of bounds given by threshold range	High Threshold 66.62 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			AC friction torque is greater than commanded by AC control software or less than threshold limit	High Threshold 40.00 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Difference of Oil temperature delta friction torque and its redundant	High Threshold 66.62	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous,	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			calculation is out of bounds given by threshold range	Nm Low Threshold - 66.62 Nm			0.5 down time multipier	
			Generator friction torque is out of bounds given by threshold range	High Threshold 66.62 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Absolute difference between the Supercharger friction torque and its redundant calculation greater than threshold	66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Filtered Torque error magnitude or its increase rate of change is out of allowable range or its dual store copy do not match	High Threshold 66.62 Nm Low Threshold -66.62 Nm Rate of change threshold 4.16 Nm/loop		Engine speed >0rpm MAF, MAP and Baro DTCs are false	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Torque error compensation is out of bounds given by threshold range	High Threshold 66.62 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Delta Torque Baro compensation is out of bounds given by threshold range	High Threshold 6.29 Nm Low Threshold -3.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			1. Difference of reserve torque value and its redundant calculation exceed threshold OR 2. Reserve request does not agree with operating conditions or Difference of final predicted torque and its redundant calculation exeed threshold OR 3. Rate of change of reserve torque exceeds threshold, increasing direction only OR 4. Reserve engine torque	1. 65.62 Nm 2. N/A 3. 65.62 Nm 4. 65.62 Nm	3. & 4.: Ignition State	1. & 2.: Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 66.62 Nm 3. & 4.: Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			above allowable capacity threshold					
			Engine Vacuum and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of the calculated Intake Manifold Pressure during engine event versus during time event is greater than threshold	Table, f(Desired Engine Torque). See supporting tables: **P16F3_Delta MAP Threshold f(Desired Engine Torque)**		Engine speed >0rpm	Up/down timer 154 ms continuous, 0.5 down time multipier	
			Min. Axle Torque Capacity is greater than threshold	0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Driver Predicted Request is greater than its redundant calculation plus threshold	1,085.57 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR Driver Predicted Request is less than its redundant calculation minus threshold				down time multipier	
			Cold Delta Friction Torque and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Predicted torque for zero pedal determination is greater than calculated limit.	Table, f(Oil Temp, RPM). See supporting tables: **Speed Control External Load f(Oil Temp, RPM)** + 66.62 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Commanded Predicted Axle Torque and its dual store do not match	1 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Steady State Estimated Engine Torque and its dual store are not equal	N/A		AFM not changing from Active to Inactive and preload torque not changing and one loop after React command Engine speed >0rpm	Up/down timer 1,988 ms continuous, 0.5 down time multipier	
			Difference of Weighting factor for number of cylinders fueled and its redundant calculation is above threshold	0.26		Engine run flag = TRUE > 10.00 s	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Difference of minimum spark advance limit and	15.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 154	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			its redundant calculation is out of bounds given by threshold range				ms continuous, 0.5 down time multipier	
			Difference of commanded spark advance and adjusted delivered is out of bounds given by threshold range	15.00 degrees		Engine speed >0rpm	Up/down timer 425 ms continuous, 0.5 down time multipier	
			Absolute difference between Estimated Engine Torque and its dual store are above a threshold	66.62 Nm		Engine speed >0rpm	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Absolute difference between Estimated Engine Torque without reductions due to torque control and its dual store are above a threshold	66.62 Nm		Engine speed >0rpm	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Difference of desired spark advance for managed torque and its redundant calculation is out of bounds given by threshold range	15.00 degrees		Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 66.62 Nm	Up/down timer 454 ms continuous, 0.5 down time multipier	
			Absolute difference of Engine Capacity Minimum Running Immediate Brake Torque Excluding Cylinder Sensitivity and its redundant calculation is out of bounds given by threshold range	67 Nm		Engine speed >0rpm	Up/down timer 175 ms continuous, 0.5 down time multipier	
			One step ahead calculation of air-per-cylinder greater than two step ahead calculation by threshold for time	Threshold: Dynamically calculated based on current engine conditions Fault Pending		Engine speed > 600 rpm	Up/down timer 454 ms continuous, 0.5 down time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				Threshold: 100 ms			multipier	
			Rate limited cruise axle torque request and its dual store do not match within a threshold	135.70 Nm	Ignition State	Accessory, run or crank	Up/down timer 163 ms continuous, 0.5 down time multipier	
			1. Absolute difference of Calculated accelerator pedal position compensated for carpet learn and error conditions and its redundant calculation is out of bounds given by threshold range OR 2. Absolute difference of Calculated accelerator pedal position compensated for carpet learn and error conditions and its dual store do not equal	1. 5.00 % 2. N/A 3. N/A	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR 3. Absolute difference of Calculated accelerator pedal position and its dual store do not equal					
			Commanded axle torque is greater than its redundant calculation by threshold	1,085.57 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Commanded axle torque is less than its redundant calculation by threshold	1,628.35 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Preload timer and its redundant calculation do not equal	N/A	Ignition State	Accessory, run or crank	Up/down timer 154 ms continuous, 0.5	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						AFM apps only	down time multipier	
			AC friction torque is greater than commanded by AC control software	40.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Engine Speed Lores Intake Firing (time based) calculation does not equal its redundant calculation	N/A		Engine speed >0rpm	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of the calculated spark offset for equivalence ratio and its redundant cacluation is greater than a threshold	15.00 degrees		Engine speed >0rpm	Up/down timer 154 ms continuous, 0.5 down time multipier	
			Transmission Torque Request cacluations do not equal their dual stores	N/A		Run or Crank = TRUE > 0.50 s	16 / 32 counts; 25.0msec/count	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Absolute difference of the predicted motor torque ACS and its redundant cacluation is greater than a threshold	0.01 Nm			Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Absolute difference of maximum throttle area and its redundant cacluation is greater than a threshold	15 mm2			Up/down timer 121 ms continuous, 0.5 down time multipier	
			Absolute difference of Desired TIAP and its redundant cacluation is greater than a threshold	5.00 kPa			Up/down timer 475 ms continuous, 0.5 down time multipier	
			Pedal learns and their redundant calculation do not equal		Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Throttle learns and their redundant calculation do not equal		Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Desired Throttle Position and its redundant calculation do not equal		Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ECM/PCM Power Relay Request Signal Message Counter Incorrect	P16FF	This DTC monitors for an error in communication with the ECM Power Relay Request Signal	Communication of the Alive Rolling Count or Protection Value from the ECM Power Relay Request Signal over CAN bus is incorrect for	>= 8 counts	All the following conditions are met for	>= 3.00 seconds	Executes in 250ms loop.	Type B, 2 Trips
					Power Mode	= Run		
					Powertrain Relay Voltage	>= 11.00 Volts		
					Run/Crank Ignition Voltage	>= 11.00 Volts		
			out of total samples	>= 16 counts				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Performance (For use on vehicles with mechanical transfer pump dual fuel tanks)	P2066	This DTC will detect a fuel sender stuck in range in the secondary fuel tank.	****************************** Fuel Level in Primary and Secondary Tanks Remain in an Unreadable Range too Long ****************************** This subtest is used If fuel volume in primary tank is and fuel volume in secondary tank is and remains in this condition for of fuel consumed by the engine. OR ****************************** Fuel Level is in a Readable Range for both Primary and Secondary Tanks too Long ****************************** This subtest is not used Volume in primary tank is and volume in secondary tank is and remains in this condition for OR ****************************** Fuel consumed without a Secondary Fuel Level Change	≥ 43.9 liters < 4.8 liters 14.2 liters < 44 liters > 5 liters 1,800 seconds	Engine Running No active DTCs: Volume in secondary tank	VehicleSpeedSensor_FA ≥ 4.8 liters	250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			****************************** If the vehicle is driven with the fuel consumed by the engine of without the secondary fuel level changing by 3 liters, then the sender must be stuck.	20 liters				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Circuit Low Voltage (For use on vehicles with dual fuel tanks)	P2067	This DTC will detect a fuel sender stuck out of range low in the secondary fuel tank.	Fuel level Sender % of 5V range	< 10 % or 35.75 liters			100 failures out of 125 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Circuit High Voltage (For use on vehicles with dual fuel tanks)	P2068	This DTC will detect a fuel sender stuck out of range low in the secondary fuel tank.	Fuel level Sender % of 5V range	> 60 % or 0.00 liters			100 failures out of 125 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Actuator Solenoid Circuit Low– Bank 1	P2088	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Actuator Solenoid Circuit High – Bank 1	P2089	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	System supply Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Actuator Solenoid Circuit Low – Bank 1	P2090	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Actuator Solenoid Circuit High – Bank 1	P2091	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Actuator Solenoid Circuit Low– Bank 2	P2092	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Actuator Solenoid Circuit High– Bank 2	P2093	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Actuator Solenoid Circuit Low – Bank 2	P2094	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Actuator Solenoid Circuit High – Bank 2	P2095	Controller specific output driver circuit diagnoses the CAM phaser oil control valve solenoid high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Post Catalyst Fuel Trim System Low Limit Bank 1 (Too Rich)	P2096	Determines if the post catalyst O2 sensor based fuel control system is indicating a rich exhaust gas condition. If the rich condition is such that the control system utilizes all or most of its available low limit authority (low limit = -100% authority), then P2096 will set. The monitor can be calibrated to fail based on the Average Integral Offset % Authority, the Average Total Offset % Authority or both combined. The Average Total Offset metric consists of the average of the Integral Offset+ Proportional Offset. Note: When the post catalyst O2 voltage is too rich, the post catalyst O2 integral and proportional offset control is decreased (negative % authority). This applies a lean bias to fuel control in an attempt to counteract the rich condition. A perfectly balanced control system (no rich or lean bias required) is represented by integral	The Average Integral Offset % Authority AND The Average Total Offset % Authority (Note: any value greater than or equal to +100% effectively nullifies the Average Total Offset % Authority criteria) High Vapor Feature: The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 30 % for >= 5.0 seconds AND the % Authority metric is approaching the failure threshold. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 26 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	<= -90.0 % <= 0.0 % If the P2096 is actively failing then the Average Integral Offset must be > -50.0 % and the Average Total Offset must be > -200.0 % for the diagnostic to report a pass.	The diagnostic is enabled during: Deceleration Idle Cruise Light Acceleration Heavy Acceleration Ambient Air Pressure Engine AirFlow Intake Manifold Pressure Induction Air Temperature Start-up Coolant Temp. PTO Intrusive diag. fuel control O2 Heater Learned Resistance Long Term Secondary Fuel Trim Enabled for (see "**Long Term Secondary Fuel Trim Enable Criteria**" in Supporting Tables) High Vapor Conditions Green Cat System Condition	 No No Yes Yes Yes >= 70 kPa >= 0.0 g/s <= 10,000.0 >= 10 kPa <= 250 >= -20 deg. C <= 150 >= -20 deg. C (or OBD Coolant Enable Criteria = TRUE) Not Active Not Active = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") >= 0.1 seconds Not Present = Not Valid, Green Cat System condition is considered valid until the accumulated air flow is greater than 720,000	Frequency: Continuous Monitoring in 100ms loop. The Integral and Total Offset % Authority metrics are sampled every 100ms and an average is calculated every 45.0 seconds (450 samples) before comparing to their respective failure thresholds.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		and proportional offset values of "0" (i.e. 0% authority) and a post catalyst O2 sensor that is within its optimal operating range (neither rich nor lean).				grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is above 22 grams/sec.		
					No Fault Active for:	AmbientAirDefault AIR System FA Ethanol Composition Sensor FA ECT_Sensor_FA EGRValveCircuit_FA EGRValvePerformance_FA IAT_SensorFA CamSensorAnyLocationFA EvapEmissionSystem_FA EvapFlowDuringNonPurge_FA FuelTankPressureSnsrCkt_FA EvapPurgeSolenoidCircuit_FA EvapSmallLeak_FA EvapVentSolenoidCircuit_FA FuelInjectorCircuit_FA MAF_SensorFA MAF_SensorTFTKO MAP_SensorFA MAP_EngineVacuumStatus EngineMisfireDetected_FA A/F Imbalance Bank1 O2S_Bank_1_Sensor_1_FA O2S_Bank_1_Sensor_2_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					For the cells identified as enabled (i.e. those containing a "Yes" at the beginning of the Enable Conditions column), the minimum accumulated samples required before the fuel control metric is considered usable for that cell (1 sample = 100ms):			
					Deceleration	50		
					Idle	50		
					Cruise	50		
					Light Acceleration	50		
					Heavy Acceleration	50		
					(Note: A value in any of the above operating "cells" that is an order of magnitude (or more) higher than other cells is an indication that the diagnostic is not capable of diagnosing in that cell).			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Post Catalyst Fuel Trim System High Limit Bank 1 (Too Lean)	P2097	Determines if the post catalyst O2 sensor based fuel control system is indicating a lean exhaust gas condition. If the lean condition is such that the control system utilizes all or most of its available high limit authority (high limit = 100% authority), then P2097 will set. The monitor can be calibrated to fail based on the Average Integral Offset % Authority, the Average Total Offset % Authority or both combined. The Average Total Offset metric consists of the average of the Integral Offset+ Proportional Offset. Note: When the post catalyst O2 voltage is too lean, the post catalyst O2 integral and proportional offset control is increased (positive % authority). This applies a rich bias to fuel control in an attempt to counteract the lean condition. A perfectly balanced control system (no rich or lean bias required) is represented by integral	The Average Integral Offset % Authority AND The Average Total Offset % Authority (Note: any value less than or equal to -100% effectively nullifies the Average Total Offset % Authority criteria) High Vapor Feature: The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 30 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 26 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	>= 90.0 % >= 0.0 % If the P2097 is actively failing then the Average Integral Offset must be < 50.0 % and the Average Total Offset must be < 200.0 % for the diagnostic to report a pass.	Same as P2096	Same as P2096	Frequency: Continuous Monitoring in 100ms loop. The Integral and Total Offset % Authority metrics are sampled every 100ms and an average is calculated every 45.0 seconds (450 samples) before comparing to their respective failure thresholds.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		and proportional offset values of "0" (i.e. 0% authority) and a post catalyst O2 sensor that is within its optimal operating range (neither rich nor lean).						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Post Catalyst Fuel Trim System Low Limit Bank 2 (Too Rich)	P2098	Determines if the post catalyst O2 sensor based fuel control system is indicating a rich exhaust gas condition. If the rich condition is such that the control system utilizes all or most of its available low limit authority (low limit = -100% authority), then P2098 will set. The monitor can be calibrated to fail based on the Average Integral Offset % Authority, the Average Total Offset % Authority or both combined. The Average Total Offset metric consists of the average of the Integral Offset+ Proportional Offset. Note: When the post catalyst O2 voltage is too rich, the post catalyst O2 integral and proportional offset control is decreased (negative % authority). This applies a lean bias to fuel control in an attempt to counteract the rich condition. A perfectly balanced control system (no rich or lean bias required) is represented by integral	The Average Integral Offset % Authority AND The Average Total Offset % Authority (Note: any value greater than or equal to +100% effectively nullifies the Average Total Offset % Authority criteria) High Vapor Feature: The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 30 % for >= 5.0 seconds AND the % Authority metric is approaching the failure threshold. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 26 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	<= -90.0 % <= 0.0 % If the P2098 is actively failing then the Average Integral Offset must be > -50.0 % and the Average Total Offset must be > -200.0 % for the diagnostic to report a pass.	The diagnostic is enabled during: Deceleration Idle Cruise Light Acceleration Heavy Acceleration Ambient Air Pressure Engine AirFlow Intake Manifold Pressure Induction Air Temperature Start-up Coolant Temp. PTO Intrusive diag. fuel control O2 Heater Learned Resistance Long Term Secondary Fuel Trim Enabled for (see "Long Term Secondary Fuel Trim Enable Criteria" in Supporting Tables) High Vapor Conditions Green Cat System Condition	No No Yes Yes Yes >= 70 kPa >= 0.0 g/s <= 10,000.0 >= 10 kPa <= 250 >= -20 deg. C <= 150 >= -20 deg. C (or OBD Coolant Enable Criteria = TRUE) Not Active Not Active = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") >= 0.1 seconds Not Present = Not Valid, Green Cat System condition is considered valid until the accumulated air flow is greater than 720,000	Frequency: Continuous Monitoring in 100ms loop. The Integral and Total Offset % Authority metrics are sampled every 100ms and an average is calculated every 45.0 seconds (450 samples) before comparing to their respective failure thresholds.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		and proportional offset values of "0" (i.e. 0% authority) and a post catalyst O2 sensor that is within its optimal operating range (neither rich nor lean).				grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is above 22 grams/sec.		
					No Fault Active for:	AmbientAirDefault AIR System FA Ethanol Composition Sensor FA ECT_Sensor_FA EGRValveCircuit_FA EGRValvePerformance_FA IAT_SensorFA CamSensorAnyLocationFA EvapEmissionSystem_FA EvapFlowDuringNonPurge_FA FuelTankPressureSnsrCkt_FA EvapPurgeSolenoidCircuit_FA EvapSmallLeak_FA EvapVentSolenoidCircuit_FA FuelInjectorCircuit_FA MAF_SensorFA MAF_SensorTFTKO MAP_SensorFA MAP_EngineVacuumStatus EngineMisfireDetected_FA A/F Imbalance Bank2 O2S_Bank_2_Sensor_1_FA O2S_Bank_2_Sensor_2_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					For the cells identified as enabled (i.e. those containing a "Yes" above), the minimum accumulated samples required before the fuel control metric is considered usable for that cell (1 sample = 100ms): Deceleration Idle Cruise Light Acceleration Heavy Acceleration Note: A value in any of the above operating "cells" that is an order of magnitude (or more) higher than other cells is an indication that the diagnostic is not capable of diagnosing in that cell).	 50 50 50 50 50		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Post Catalyst Fuel Trim System High Limit Bank 2 (Too Lean)	P2099	Determines if the post catalyst O2 sensor based fuel control system is indicating a lean exhaust gas condition. If the lean condition is such that the control system utilizes all or most of its available high limit authority (high limit = 100% authority), then P2099 will set. The monitor can be calibrated to fail based on the Average Integral Offset % Authority, the Average Total Offset % Authority or both combined. The Average Total Offset metric consists of the average of the Integral Offset+ Proportional Offset. Note: When the post catalyst O2 voltage is too lean, the post catalyst O2 integral and proportional offset control is increased (positive % authority). This applies a rich bias to fuel control in an attempt to counteract the lean condition. A perfectly balanced control system (no rich or lean bias required) is represented by integral	The Average Integral Offset % Authority AND The Average Total Offset % Authority (Note: any value less than or equal to -100% effectively nullifies the Average Total Offset % Authority criteria) High Vapor Feature: The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 30 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 26 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	>= 90.0 % . >= 0.0 % If the P2099 is actively failing then the Average Integral Offset must be < 50.0 % and the Average Total Offset must be < 200.0 % for the diagnostic to report a pass.	Same as P2098	Same as P2098	Frequency: Continuous Monitoring in 100ms loop. The Integral and Total Offset % Authority metrics are sampled every 100ms and an average is calculated every 45.0 seconds (450 samples) before comparing to their respective failure thresholds.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		and proportional offset values of "0" (i.e. 0% authority) and a post catalyst O2 sensor that is within its optimal operating range (neither rich nor lean).						

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	1) Detect a throttle positioning error. This is determined if the difference between measured throttle position and modeled throttle position is greater than a threshold or less than a threshold. This diagnostic only runs when the engine is running and the ignition voltage is high enough and there is not an ignition votage failure and the throttle position minimum learn is not active and the throttle is being controlled 2) Throttle control is driving the throttle in the incorrect direction. This is determined if the throttle position is greater than a threshold percent and the powertrain relay voltage is high enough and the throttle position minimum learn is active 3) Throttle control exceeds the reduced power limit. This is determined if the throttle position is greater and a threshold and the powertrain relay voltage is high enough and reduced power is active.	Difference between measured throttle position and modeled throttle position > OR Difference between modeled throttle position and measured throttle position >	6.08 percent 6.08 percent	Run/Crank voltage TPS minimum learn is not active and Throttle is being Controlled AND (Engine Running or Ignition Voltage) OR Ignition Voltage Ignition voltage failure is false (P1682)	> 6.41 Volts > 5.50 Volts > 8.41 Volts	15 counts; 12.5 ms/count in the primary processor	Type A, 1 Trips
			Throttle Position >	36.00 percent	Powertrain Relay voltage TPS minimum learn active	> 6.41 Volts = TRUE	11 counts; 12.5 ms/count in the primary processor	
			Throttle Position >	35.00 percent	Powertrain Relay voltage Reduced Power	> 6.41 Volts = TRUE	11 counts; 12.5 ms/count in the primary processor	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Accelerator Pedal Position (APP) Sensor 1 Lo	P2122	Detects a continuous or intermittent short low or open in the APP sensor #1 by monitoring the APP1 sensor percent Vref and failing the diagnostic when the APP1 percent Vref is too low. This diagnostic only runs when battery voltage is high enough. Detects a continuous or intermittent short low or open in the APP sensor #1 on the Main processor.	APP1 percent Vref	< 0.4625 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P06A3	19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Accelerator Pedal Position (APP) Sensor 1 Hi	P2123	Detects a continuous or intermittent short high in the APP sensor #1 by monitoring the APP1 sensor percent Vref and failing the diagnostic when the APP1 percent Vref is too high. This diagnostic only runs when battery voltage is high enough. Detect a continuous or intermittent short high in the APP sensor #1 on the Main processor.	APP1 percent Vref >	4.7500 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P06A3	19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Accelerator Pedal Position (APP) Sensor 2 Lo	P2127	Detects a continuous or intermittent short low or open in the APP sensor #2 by monitoring the APP2 sensor percent Vref and failing the diagnostic when the APP2 percent Vref is too low. This diagnostic only runs when battery voltage is high enough. Detects a continuous or intermittent short low or open in the APP sensor #2 on the Main processor.	APP2 percent Vref <	0.3250 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P0697	19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Accelerator Pedal Position (APP) Sensor 2 Hi	P2128	Detects a continuous or intermittent short high in the APP sensor #2 by monitoring the APP2 sensor percent Vref and failing the diagnostic when the APP2 percent Vref is too high. This diagnostic only runs when battery voltage is high enough. Detect a continuous or intermittent short high in the APP sensor #2 on the Main processor.	APP2 percent Vref >	2.6000 % Vref	Run/Crank voltage No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts P0697	19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position (TP) Sensor 1-2 Correlation	P2135	Detect a continuous or intermittent correlation fault between TPS sensors #1 and #2 on Main processor. 1.) The diagnostic monitors the difference in position between TPS1 and the TPS2 and fails the diagnostic when the difference is too high. This diagnostic only runs when the battery voltage is high enough. 2.) The diagnostic monitors the difference in reference voltage between normalized min TPS1 and the normalized min TPS2 and fails the diagnostic when the difference is too high. This diagnostic only runs when the battery voltage is high enough. Detects a continuous or intermittent correlation fault between TPS sensors #1 and #2 on Main processor	Difference between TPS1 displaced and TPS2 displaced >	6.797 % offset at min. throttle position with a linear threshold to 9.720 % at max. throttle position	Run/Crank voltage No TPS sensor faults No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts (P0122, P0123, P0222, P0223) P06A3	79 / 159 counts or 58 counts continuous; 3.125 ms/count in the main processor	Type A, 1 Trips
			Difference between (normalized min TPS1) and (normalized min TPS2) >	5.000 % Vref	Run/Crank voltage No TPS sensor faults No 5V reference error or fault for # 4 5V reference circuit	> 6.41 Volts (P0122, P0123, P0222, P0223) P06A3	79 / 159 counts or 58 counts continuous; 3.125 ms/count in the main processor	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P2138	Detect a continuous or intermittent correlation fault between APP sensors #1 and #2 on Main processor. 1.) The diagnostic monitors the difference in position between APP1 and the APP2 and fails the diagnostic when the difference is too high. This diagnostic only runs when the battery voltage is high enough. 2.) The diagnostic also monitors the difference in reference voltage between normalized min APP1 and the normalized min APP2 and fails the diagnostic when the difference is too high. This diagnostic only runs when the battery voltage is high enough. Detects a continuous or intermittent correlation fault between APP sensors #1 and #2 on Main processor	Difference between APP1 displaced and APP2 displaced >	5.000 % offset at min. pedal position with a linear threshold to 10.001 % at max. pedal position	Run/Crank voltage No APP sensor faults No 5V reference errors or faulst for # 3 & # 4 5V reference circuits	> 6.41 Volts (P2122, P2123,P2127, P2128) (P06A3, P0697)	19 / 39 counts intermittent or 15 counts continuous, 12.5 ms/count in the main processor	Type A, 1 Trips
			Difference between (normalized min APP1) and (normalized min APP2) >	5.000 % Vref	Run/Crank voltage No APP sensor faults No 5V reference errors or faulst for # 3 & # 4 5V reference circuits	> 6.41 Volts (P2122, P2123,P2127, P2128) (P06A3, P0697)	19 / 39 counts intermittent or 15 counts continuous, 12.5 ms/count in the main processor	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 high side circuit shorted to ground	P2147	Controller specific output driver circuit diagnoses Injector 1 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 high side circuit shorted to power	P2148	Controller specific output driver circuit diagnoses Injector 1 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 high side circuit shorted to ground	P2150	Controller specific output driver circuit diagnoses Injector 2 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 high side circuit shorted to power	P2151	Controller specific output driver circuit diagnoses Injector 2 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 high side circuit shorted to ground	P2153	Controller specific output driver circuit diagnoses Injector 3 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 high side circuit shorted to power	P2154	Controller specific output driver circuit diagnoses Injector 3 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 <= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 high side circuit shorted to ground	P2156	Controller specific output driver circuit diagnoses Injector 4 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 high side circuit shorted to power	P2157	Controller specific output driver circuit diagnoses Injector 4 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 <= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 high side circuit shorted to ground	P216B	Controller specific output driver circuit diagnoses Injector 5 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 high side circuit shorted to power	P216C	Controller specific output driver circuit diagnoses Injector 5 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 high side circuit shorted to ground	P216E	Controller specific output driver circuit diagnoses Injector 6 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 high side circuit shorted to power	P216F	Controller specific output driver circuit diagnoses Injector 6 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 1 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Minimum Throttle Position Not Learned	P2176	Detect when the throttle position minimum learn on the main processor is not learned. This diagnostic detects this by monitoring if the throttle position is greater than a threshold and the number of learn attempts is greater than a threshold. This diagnostic only runs when the battery voltage is high enough and the throttle position minimum learn is active. Throttle position sensors were not in the minmum learn window after multiple attempts to learn the minimum.	During TPS min learn on the Main processor, TPS percent Vref > AND Number of learn attempts >	0.5740 % Vref 10 counts	Run/Crank voltage TPS minimum learn is active No previous TPS min learn values stored in long term memory	> 6.41 Volts = TRUE	2.0 secs	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 1 / 2 Correlation	P2199	Detects when the Intake Air Temperature (IAT) sensor and IAT2 sensor values do not correlate with each other. These two temperature sensors are both in the induction system, although they do have different sensor time constants and different positional relationships with components that produce heat. If these two temperature values differ by a large enough amount, the Intake Air Temperature 1 / 2 Correlation Diagnostic will fail. This diagnostic is enabled if the Powertrain Relay voltage is high enough.	ABS (IAT - IAT2)	> 55.0 deg C	Powertrain Relay Voltage for a time No Active DTCs:	>= 11.0 Volts >= 0.9 seconds PowertrainRelayFault	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Bank 1 Air-Fuel Ratio Imbalance	P219A	This monitor determines if there is an Air Fuel Imbalance in the fueling system for a cylinder on a Bank 1. Detection is based on a the pre catalyst oxygen sensor voltage. The pre catalyst O2 voltage is used to generate a variance metric that represents the statistical variation of the O2 sensor voltage over a given engine cycle. This metric is proportional to the air-fuel ratio imbalance (variance is higher with an imbalance than without). The observed Variance is dependent on engine speed and load and is normalized by comparing it to a known "good system" result for that speed and load, and generating a Ratio metric. The Ratio metric is calculated by selecting the appropriate threshold calibration from a 17x17 table (see Supporting Table	Filtered Ratio > The Ratio metric is calculated by selecting the appropriate threshold calibration from a 17x17 table (see Supporting Table **P219A Variance Threshold Bank1 Table**) and subtracting it from the measured Variance. The result is then divided by a normalizer calibration from another 17 x 17 table (see Supporting Table **P219A Normalizer Bank1 Table**). This quotient is then multiplied by a quality factor calibration from a 17 x 17 table (see Supporting Table **P219A Quality Factor Bank1 Table**). This result is referred to as the Ratio. Note that the quality factor ranges between 0 and 1 and represents robustness to false diagnosis in the current operating region. Regions with low quality factors are not used.	0.70 If the diagnostic has reported a failure on the prior trip, the Filtered Ratio must fall below 0.65 in order to report a pass. This feature prevents the diagnostic from toggling between failing and passing when the Filtered Ratio remains near the initial failure threshold of 0.70 .	System Voltage Fuel Level Engine Coolant Temperature Cumulative engine run time Diagnostic enabled at Idle (regardless of other operating conditions) Engine speed range Engine speed delta during a short term sample period Mass Airflow (MAF) range Cumulative delta MAF during a short term sample period Filtered MAF delta between samples Note: first order lag filter coefficient applied to MAF = 0.050 Air Per Cylinder (APC) APC delta during short term sample period	no lower than 11.0 Volts for more than 0.2 seconds > 10.0 percent AND no fuel level sensor fault > -20 deg. C (or OBD Coolant Enable Criteria = TRUE) > 30.0 seconds No 1,000 to 3,000 RPM < 200 RPM 0 to 1,000 g/s < 5 g/s < 0.30 g/s 200 to 400 mg/cylinder < 30 mg/cylinder	Minimum of 1 test per trip, up to 15 tests per trip during RSR or FIR. The front O2 sensor voltage is sampled once per cylinder event. Therefore, the time required to complete a single test (when all enable conditions are met) decreases as engine speed increases. For example, 8.00 seconds of data is required at 1000 rpm while double this time is required at 500 rpm and half this time is required at 2000 rpm. This data is collected only when enable conditions are met, and as such significantly more operating time is required than is indicated above. Generally, a report will be	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		P219A Variance Threshold Bank1 Table) and subtracting it from the measured Variance. The result is then divided by a normalizer calibration from another 17 x 17 table (see Supporting Table **P219A Normalizer Bank1 Table**). This quotient is then multiplied by a quality factor calibration from a 17 x 17 table (see Supporting Table **P219A Quality Factor Bank1 Table**) . This result is referred to as the Ratio. Note that the quality factor ranges between 0 and 1 and represents robustness to false diagnosis in the current operating region. Regions with low quality factors are not used. Finally, a EWMA filter is applied to the Ratio metric to generate the Filtered Ratio malfunction criteria metric. Generally, a normal system will result in a negative Filtered Ratio while a failing system will result in a positive Filtered			Filtered APC delta between samples Note: first order lag filter coefficient applied to APC = 0.250 Spark Advance Throttle Area (percent of max) Intake Cam Phaser Angle Exhaust Cam Phaser Angle Quality Factor (QF) QF calibrations are located in a 17x17 lookup table versus engine speed and load (see Supporting Table **P219A Quality Factor Bank1 Table**). QF values less than “1” indicate that we don’t have 4sigma/2sigma robustness in that region. The quality of the data is determined via statistical analysis of Variance data. Fuel Control Status Closed Loop and Long Term FT Enabled for:	< 5.00 percent 5 to 70 degrees 0 to 200 percent -50 to 50 degrees -50 to 50 degrees >= 0.90 >= 5.0 seconds (Please see "**Closed Loop Enable Clarification**" and "**Long Term FT Enable Criteria**" in Supporting Tables)	made within 5 minutes of operation. For RSR or FIR, 30 tests must complete before the diagnostic can report.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Ratio. The range of the Filtered Ratio metric is application specific since both the emissions sensitivity and relationship between imbalance and the Variance metric are application specific. Some applications may need to command a unique cam phaser value before performing the above calculations since cam phasing has been shown to have an impact on overall signal quality. This application Does Not Use this feature.			Device Control	Not active		
					AIR pump	Not on		
					CASE learn	Not active		
					EGR	Not intrusive		
					EVAP	Not intrusive		
					Engine Over Speed Protection	Not Active		
					Idle speed control	Normal		
					PTO	Not Active		
					Injector base pulse width	Above min pulse limit		
					O2 learned htr resistance	= Valid (the O2 heater resistance has learned since NVM reset)		
					Rapid Step Response (RSR): RSR will trigger if the Ratio result from the last test is	>= 0.27		
					AND it exceeds the last Filtered ratio by	>= 0.10		
					Once triggered, the filtered ratio is reset to:	0.00		
					Fast Initial Response (FIR): FIR will trigger when an NVM reset or code clear occurs. Once triggered, the filtered ratio is reset to:	0.00		
					No Fault Active for:	EngineMisfireDetected_FA MAP_SensorFA MAF_SensorFA ECT_Sensor_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						TPS_ThrottleAuthorityDefaulted FuelInjectorCircuit_FA AIR System FA EvapExcessPurgePsbl_FA CamSensorAnyLocationFA FuelTrimSystemB1_FA O2S_Bank_1_Sensor_1_FA O2S_Bank_1_Sensor_2_FA WRAF_Bank_1_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Bank 2 Air-Fuel Ratio Imbalance	P219B	This monitor determines if there is an Air Fuel Imbalance in the fueling system for a cylinder on a Bank 2. Detection is based on a the pre catalyst oxygen sensor voltage. The pre catalyst O2 voltage is used to generate a variance metric that represents the statistical variation of the O2 sensor voltage over a given engine cycle. This metric is proportional to the air-fuel ratio imbalance (variance is higher with an imbalance than without). The observed Variance is dependant on engine speed and load and is normalized by comparing it to a known "good system" result for that speed and load, and generating a Ratio metric. The Ratio metric is calculated by selecting the appropriate threshold calibration from a 17x17 table (see Supporting Table	Filtered Ratio > The Ratio metric is calculated by selecting the appropriate threshold calibration from a 17x17 table (see Supporting Table **P219B Variance Threshold Bank2 Table**) and subtracting it from the measured Variance. The result is then divided by a normalizer calibration from another 17 x 17 table (see Supporting Table **P219B Normalizer Bank2 Table**) This quotient is then multiplied by a quality factor calibration from a 17 x 17 table (see Supporting Table **P219B Quality Factor Bank2 Table**). This result is referred to as the Ratio. Note that the quality factor ranges between 0 and 1 and represents robustness to false diagnosis in the current operating region. Regions with low quality factors are not used.	0.75 If the diagnostic has reported a failure on the prior trip, the Filtered Ratio must fall below 0.65 in order to report a pass. This feature prevents the diagnostic from toggling between failing and passing when the Filtered Ratio remains near the initial failure threshold of 0.75 .	System Voltage Fuel Level Engine Coolant Temperature Cumulative engine run time Diagnostic enabled at Idle (regardless of other operating conditions) Engine speed range Engine speed delta during a short term sample period Mass Airflow (MAF) range Cumulative delta MAF during a short term sample period Filtered MAF delta between samples Note: first order lag filter coefficient applied to MAF = 0.050 Air Per Cylinder (APC) APC delta during short term sample period	no lower than 11.0 Volts for more than 0.2 seconds > 10.0 percent AND no fuel level sensor fault > -20 deg. C (or OBD Coolant Enable Criteria = TRUE) > 30.0 seconds No 1,000 to 3,000 RPM < 200 RPM 0 to 1,000 g/s < 5 g/s < 0.30 g/s 200 to 400 mg/cylinder < 30 mg/cylinder	Minimum of 1 test per trip, up to 15 tests per trip during RSR or FIR. The front O2 sensor voltage is sampled once per cylinder event. Therefore, the time required to complete a single test (when all enable conditions are met) decreases as engine speed increases. For example, 8.00 seconds of data is required at 1000 rpm while double this time is required at 500 rpm and half this time is required at 2000 rpm. This data is collected only when enable conditions are met, and as such significantly more operating time is required than is indicated above. Generally, a report will be made within 5	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		P219B Variance Threshold Bank2 Table) and subtracting it from the measured Variance. The result is then divided by a normalizer calibration from another 17 x 17 table (see Supporting Table **P219B Normalizer Bank2 Table**) This quotient is then multiplied by a quality factor calibration from a 17 x 17 table (see Supporting Table **P219B Quality Factor Bank2 Table**) . This result is referred to as the Ratio. Note that the quality factor ranges between 0 and 1 and represents robustness to false diagnosis in the current operating region. Regions with low quality factors are not used. Finally, a EWMA filter is applied to the Ratio metric to generate the Filtered Ratio malfunction criteria metric. Generally, a normal system will result in a negative Filtered Ratio while a failing system will result in a positive Filtered			Filtered APC delta between samples Note: first order lag filter coefficient applied to APC = 0.250 Spark Advance Throttle Area (percent of max) Intake Cam Phaser Angle Exhaust Cam Phaser Angle Quality Factor (QF) QF calibrations are located in a 17x17 lookup table versus engine speed and load (Supporting Table **P219B Quality Factor Bank2 Table**). QF values less than "1" indicate that we don't have 4sigma/2sigma robustness in that region. The quality of the data is determined via statistical analysis of Variance data. Fuel Control Status Closed Loop and Long Term FT Enabled for: Device Control AIR pump	< 5.00 percent 5 to 70 degrees 0 to 200 percent -50 to 50 degrees -50 to 50 degrees >= 0.90 >= 5.0 seconds (Please see "Closed Loop Enable Clarification" and "Long Term FT Enable Criteria" in Supporting Tables) Not active Not on	minutes of operation. For RSR or FIR, 30 tests must complete before the diagnostic can report.See P219A info	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Ratio. The range of the Filtered Ratio metric is application specific since both the emissions sensitivity and relationship between imbalance and the Variance metric are application specific. Some applications may need to command a unique cam phaser value before performing the above calculations since cam phasing has been shown to have an impact on overall signal quality. This application Does Not Use this feature.			CASE learn EGR EVAP Engine Over Speed Protection Idle speed control PTO Injector base pulse width O2 learned htr resistance Rapid Step Response (RSR): RSR will trigger if the Ratio result from the last test is AND it exceeds the last Filtered ratio by Once triggered, the filtered ratio is reset to: Fast Initial Response (FIR): FIR will trigger when an NVM reset or code clear occurs. Once triggered, the filtered ratio is reset to: No Fault Active for:	Not active Not intrusive Not intrusive Not Active Normal Not Active Above min pulse limit = Valid (the O2 heater resistance has learned since NVM reset) >= 0.25 >= 0.14 0.00 0.00 EngineMisfireDetected_FA MAP_SensorFA MAF_SensorFA ECT_Sensor_FA TPS_ThrottleAuthorityDefaulted FuelInjectorCircuit_FA AIR System FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						EvapExcessPurgePsbl_FA CamSensorAnyLocationFA FuelTrimSystemB2_FA O2S_Bank_2_Sensor_1_FA O2S_Bank_2_Sensor_2_FA WRAF_Bank_2_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Performance (naturally aspirated)	P2227	Detects a performance failure in the Barometric Pressure (BARO) sensor, such as when a BARO value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The BARO sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the BARO performance diagnostic will fail. When the engine is running, there is an estimate of barometric pressure that is determined with the Manifold Pressure (MAP) sensor, throttle position, engine air flow and engine speed. If the BARO value from the sensor is not similar to this barometric pressure estimate, then the BARO performance diagnostic will fail.	**<u>Engine Running:</u>** Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update OR Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update	 > 15.0 kPa <= 1.24 miles > 20.0 kPa > 1.24 miles	No Active DTCs:	AmbPresSnsrCktFA IAT_SensorFA MAF_SensorFA AfterThrottlePressureFA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA	320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips
			<u>Engine Not Rotating:</u> Barometric Pressure OR Barometric Pressure	 < 50.0 kPa > 115.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	 > 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit Low (non-boosted applications, Gen III)	P2228	Detects a continuous short to ground in the Barometric Pressure (BARO) signal circuit by monitoring the BARO sensor output voltage and failing the diagnostic when the BARO voltage is too low. The BARO sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	BARO Voltage	< 40.0 % of 5 Volt Range (This is equal to 51.0 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit High (non-boosted applications, Gen III)	P2229	Detects a continuous short to power or open circuit in the Barometric Pressure (BARO) signal circuit by monitoring the BARO sensor output voltage and failing the diagnostic when the BARO voltage is too high. The BARO sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	BARO Voltage	> 90.0 % of 5 Volt Range (This is equal to 115.1 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit Intermittent	P2230	Detects a noisy or erratic signal in the barometric pressure (BARO) circuit by monitoring the BARO sensor and failing the diagnostic when the BARO signal has a noisier output than is expected. When the value of BARO in kilopascals (kPa) is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of BARO readings. The result of this summation is called a “string length”. Since the BARO signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic BARO signal. The diagnostic will fail if the string length is too high.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current BARO reading - BARO reading from 12.5 milliseconds previous)	> 216 kPa 80 consecutive BARO readings			4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Signal Stuck Lean Bank 1 Sensor 2	P2270	The P2270 diagnostic is the first in a sequence of six intrusive secondary O2 monitors which include DTCs P2270, P013E, P013A, P2271, P013F, & P013B. This DTC determines if the secondary O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic increases the delivered fuel while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required rich voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor signal AND The Accumulated mass air flow monitored during the Stuck Lean Voltage Test	< 800 mvolts > 68 grams	No Active DTC's B1S2 DTC's Not active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013A, P013B, P013E, P013F, P2270 or P2271 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Pedal position	≤ 1.5 %		
					Engine Airflow	4.0 ≤ gps ≤ 11.5		
					Closed loop integral	0.87 ≤ C/L Int ≤ 1.07		
					Closed Loop Active	= TRUE (Please see “**Closed Loop Enable Clarification**” in Supporting Tables).		
					Evap	not in control of purge		
					Ethanol	not in estimate mode		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					Crankshaft Torque	< 100.0 Nm		
					EGR Intrusive diagnostic	= not active		
					All post sensor heater delays	= not active		
					O2S Heater (post sensor) on Time	≥ 60.0 sec		
					Predicted Catalyst temp	575 ≤ ºC ≤ 980		
					Fuel State	= DFCO possible		
					=================	==================		
					All of the above met for at least 0.0 seconds, and then check the following			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) ================ All of the above met for at least 2.0 seconds, and then the Force Cat Rich intrusive stage is requested. ================ During Stuck Lean test the following must stay TRUE or the test will abort: Commanded Fuel Crankshaft Torque	850 ≤ RPM ≤ 2,500 800 ≤ RPM ≤ 2,550 42.3 ≤ MPH ≤ 80.2 38.5 ≤ MPH ≤ 82.0 0.96 ≤ EQR ≤ 1.08 < 20.0 Nm		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	P2271	The P2271 diagnostic is the fourth in a sequence of six intrusive secondary O2 monitors which include DTCs P2270, P013E, P013A, P2271, P013F, & P013B. This DTC determines if the secondary O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic commands fuel cut off while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required lean voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor signal AND The Accumulated mass air flow monitored during the Stuck Rich Voltage Test	> 100 mvolts > 9.0 grams	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013A, P013B, P013E, P013F or P2270 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Fuel State	= DFCO possible		
					DTC's Passed	= P2270 = P013E = P013A		
					================== After above conditions are met: DFCO mode is continued (w/o driver initiated pedal input).	=================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Signal Stuck Lean Bank 2 Sensor 2	P2272	The P2272 diagnostic is the first in a sequence of six intrusive secondary O2 monitors which include DTCs P2272, P014A, P013C, P2273, P014B, & P013D. This DTC determines if the secondary O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic increases the delivered fuel while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required rich voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor signal AND The Accumulated mass air flow monitored during the Stuck Lean Voltage Test	< 800 mvolts > 68 grams.	No Active DTC's B2S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013C, P013D, P014A, P014B, P2272 or P2273 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Pedal position	≤ 1.5 %		
					Engine Airflow	4.0 ≤ gps ≤ 11.5		
					Closed loop integral	0.87 ≤ C/L Int ≤ 1.07		
					Closed Loop Active	= TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables).		
					Evap	not in control of purge		
					Ethanol	not in estimate mode		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					Crankshaft Torque	< 100.0 Nm		
					EGR Intrusive diagnostic	= not active		
					All post sensor heater delays	= not active		
					O2S Heater (post sensor) on Time	>= 60.0 sec		
					Predicted Catalyst temp	575 ≤ ºC ≤ 980		
					Fuel State	= DFCO possible		
					================ All of the above met for at least 0.0 seconds, and then check the following	=================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Engine Speed to initially enable test	850 ≤ RPM ≤ 2,500		
					Engine Speed range to keep test enabled (after initially enabled)	800 ≤ RPM ≤ 2,550		
					Vehicle Speed to initially enable test	42.3 ≤ MPH ≤ 80.2		
					Vehicle Speed range to keep test enabled (after initially enabled)	38.5 ≤ MPH ≤ 82.0		
					================== All of the above met for at least 2.0 seconds, and then the Force Cat Rich intrusive stage is requested. =================			
					During Stuck Lean test the following must stay TRUE or the test will abort:			
					Commanded Fuel	0.96 ≤ EQR ≤ 1.08		
					Crankshaft Torque	< 20.0 Nm		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Signal Stuck Rich Bank 2 Sensor 2	P2273	The P2273 diagnostic is the fourth in a sequence of six intrusive secondary O2 monitors which include DTCs P2272, P014A, P013C, P2273, P014B, & P013D. This DTC determines if the secondary O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for secondary O2 sensor fuel control or for catalyst monitoring. This diagnostic commands fuel cut off while monitoring the sensor signal and the accumulated mass air flow. This fault is set if the secondary O2 sensor does not achieve the required lean voltage before the accumulated mass air flow threshold is reached.	Post O2 sensor signal AND The Accumulated mass air flow monitored during the Stuck Rich Voltage Test	> 100 mvolts > 9.0 grams.	No Active DTC's B2S2 DTC's Not Active this key cycle System Voltage Learned heater resistance ICAT MAT Burnoff delay Green O2S Condition	TPS_ThrottleAuthorityDefaulted ECT_Sensor_FA IAT_SensorFA MAF_SensorFA MAP_SensorFA AIR System FA FuelInjectorCircuit_FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EngineMisfireDetected_FA Ethanol Composition Sensor FA P013C, P013D, P014A, P014B or P2272 > 10.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					  Low Fuel Condition Only when FuelLevelDataFault Fuel State DTC's Passed =================== After above conditions are met: DFCO mode is continued (wo driver initiated pedal input).	is above 22.0 grams/sec. = False = False = DFCO possible = P2272 = P014A = P013C ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Pump	P228C	This DTC determines if the high pressure pump is not able to maintain target pressure. The fault is set if the measured fuel rail pressure is lower than desired fuel pressure by a value that can impact emission and drivability for a number of pump events.	Fuel Pressure Error (Desired Pressure - Measure Pressure)	>= **P228C - High Pressure Pump Control (HPC) fail threshold of pressure too low** Mpa (see supporting tables)	High Pressure Pump Performance Diagnostic Enable Battery Voltage Low Side Fuel Pressure Engine Run Time Additional Enable Conditions: All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) andCam or Crank Sensor Not FA and IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is	True >= 11 Volts > 0.275 MPa >= **P0089 - P163A - P228C - P228D - P0191 - Engine run time threshold to Enable Diagnostic** (see supporting tables) Enabled when a code clear is not active or not exiting device control Engine is not cranking	Positive Pressure Error - 10.00 second failures out of 12.50 second samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					false and Device control pump ckt enabled on is false and Engine movement detected is true and Manufacturers enable counter is 0) Flex Fuel Sensor Not FA Ignition voltage out of correlation error(P1682) not active Barometric Pressure Inlet Air Temp Fuel Temp	 >= 70.0 KPA >= -10.0 degC -10 <=Temp degC <= 127		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Pump	P228D	This DTC determines if the high pressure pump is delivering high pressure that desired pressure. The fault is set if the measured fuel rail pressure is higher than desired fuel pressure by a value that can impact emission and drivability for a number of pump events.	Fuel Pressure Error (Desired Pressure - Measure Pressure)	<= **P228D - High Pressure Pump Control (HPC) fail threshold for pressure too high** Mpa (see supporting tables)	High Pressure Pump Performance Diagnostic Enable	True	Negative Pressure Error - 10.00 second failures out of 12.50 second samples	Type A, 1 Trips
					Battery Voltage	>= 11 Volts		
					Low Side Fuel Pressure	> 0.275 MPa		
					Engine Run Time	>= **P0089 - P163A - P228C - P228D - P0191 - Engine run time threshold to Enable Diagnostic** (see supporting tables)		
					Additional Enable Conditions: All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control	Enabled when a code clear is not active or not exiting device control Engine is not cranking		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					commanded pressure is false and Device control pump ckt enabled on is false and Engine movement detected is true andManufacturers enable counter is 0) Flex Fuel Sensor Not FA Ignition voltage out of correlation error(P1682) not active Barometric Pressure Inlet Air Temp Fuel Temp	 >= 70.0 KPA >= -10.0 DegC -10 <= Temp degC <= 127		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #1 CIRCUIT LOW	P2300	Diagnoses Cylinder #1 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 ≤ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #1 CIRCUIT High	P2301	Diagnoses Cylinder #1 Ignition Control (EST) output driver circuit for a Short to Power fault. Controller specific output driver circuit diagnoses the low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	> 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #2 CIRCUIT Low	P2303	Diagnoses Cylinder #2 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 ≤ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #2 CIRCUIT High	P2304	Diagnoses Cylinder #2 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 $\leq$ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #3 CIRCUIT Low	P2306	Diagnoses Cylinder #3 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	$\leq$ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #3 CIRCUIT High	P2307	Diagnoses Cylinder #3 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #4 CIRCUIT Low	P2309	Diagnoses Cylinder #4 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	$\leq$ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #4 CIRCUIT High	P2310	Diagnoses Cylinder #4 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #5 CIRCUIT Low	P2312	Diagnoses Cylinder #5 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #5 CIRCUIT High	P2313	Diagnoses Cylinder #5 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 $\leq$ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #6 CIRCUIT Low	P2315	Diagnoses Cylinder #6 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #6 CIRCUIT High	P2316	Diagnoses Cylinder #6 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 $\leq$ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	20 Failures out of 25 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Control Torque Request Circuit	P2544	Determines if the torque request from the TCM is valid	Protect error - Serial Communication message 2's complement not equal ($189/$199)	Message <> two's complement of message	Diagnostic Status	Enabled	>= 16 failures out of 20 samples.	Type B, 2 Trips
					Power Mode	= Run	Performed on every received message	
			OR		Ignition Voltage	> 6.41 volts		
			Rolling count error - Serial Communication message ($189/$199) rolling count index value	Message <> previous message rolling count value + one			>= 6 Rolling count errors out of 10 samples.	
					Engine Running	= True	Performed on every received message	
			OR		Run/Crank Active	> 0.50 Sec		
			Range Error - Serial Communication message - ($189/$199) TCM Requested Torque Increase	> 405 Nm	No Serial communication loss to TCM (U0101)	No loss of communication	>= 6 range errors out of 10 samples. Performed on every received message	
			OR					
			Multi-transition error - Trans torque intervention type request change	Requested torque intervention type toggles from not increasing request to increasing request			>= 3 multi-transitions out of 5 samples. Performed every 200 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Hood Switch Performance	P257D	This DTC monitors the hood switch rationality	Hood Switch position is in an invalid position. Type of Switch: CeHSWR_e_Enumerated With an enumerated type switch the hood switch reading is invalid in these ranges With a discrete type switch the hood switch reading is invalid when With a percentage type switch the hood switch reading is invalid in these ranges With a resistance type switch the hood switch reading is invalid in these ranges	1281 Ohms to 1404 Ohms Hood Switch 1 and Hood Switch 2 are in the same state (States not equal is proper function) 71.50 % to 67.80 % or 45.70 % to 43.40 % or 17.20 % to 14.60 % 6,775.00 Ohms to 2,350.00 Ohms or 2,280.00 Ohms to 750.00 Ohms or 720.00 Ohms to 300.00 Ohms	The diagnostic is enabled Enabled when Run/Crank is active only, otherwise Run/Crank is not used as an enable	= 1 (1 indicates enabled) = 1 (1 indicates Run/ Crank active enabled)	80 failed samples within 100 total samples Diagnostic runs in the 12.5 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Hood Switch Short to Ground / Low Voltage	P257E	This DTC monitors the hood switch for a short to ground or low voltage condition	Hood Switch position reading is outside an expected bounds for Type of Switch: CeHSWR_e_Enumerated With an enumerated type switch the bound is hood switch reading With a discrete type switch the bounds are With a percentage type switch the bound is hood switch reading With a resistance type switch the bound is hood switch reading	<= 325 Ohms Hood Switch 1 and Hood Switch 2 are in the same state (States not equal is proper function) <= 14.60 % <= 300.00 Ohms	The diagnostic is enabled Enabled when Run/Crank is active only, otherwise Run/Crank is not used as an enable	= 1 (1 indicates enabled) = 1 (1 indicates Run/ Crank active enabled)	80 failed samples within 100 total samples Diagnostic runs in the 12.5 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Hood Switch Short to Voltage / High Voltage	P257F	This DTC monitors the hood switch for a short to voltage or high voltage condition	Hood Switch position reading is outside an expected bounds for Type of Switch: CeHSWR_e_Enumerated With an enumerated type switch the bound is hood switch reading With a discrete type switch the bounds are With a percentage type switch the bound is hood switch reading With a resistance type switch the bound is hood switch reading	>= 3620 Ohms Hood Switch 1 and Hood Switch 2 are in the same state (States not equal is proper function) >= 71.50 % >= 6,775.00 Ohms	The diagnostic is enabled Enabled when Run/Crank is active only, otherwise Run/Crank is not used as an enable	= 1 (1 indicates enabled) = 1 (1 indicates Run/ Crank active enabled)	80 failed samples within 100 total samples Diagnostic runs in the 12.5 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VVT Lock Control Open Ckt Bnk1	P25CA	Controller specific output driver circuit diagnoses the VVL park pin system high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VVT Lock Control Low Ckt Bnk1	P25CB	Controller specific output driver circuit diagnoses the VVL park pin system high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VVT Lock Control Hi Ckt Bnk1	P25CC	Controller specific output driver circuit diagnoses the VVL park pin system high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VVT Lock Control Open Ckt Bnk2	P25CD	Controller specific output driver circuit diagnoses the VVL park pin system high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VVT Lock Control Low Ckt Bnk2	P25CE	Controller specific output driver circuit diagnoses the VVL park pin system high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
VVT Lock Control Hi Ckt Bnk2	P25CF	Controller specific output driver circuit diagnoses the VVL park pin system high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	20 failures out of 25 samples 250 ms /sample, continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Power Off Timer Performance	P262B	This DTC determines if the hardware timer does not initialize or count properly. There are two tests to ensure proper functioning of the timer: Count Up Test (CUT) and Range Test (RaTe). Count Up Test (CUT): Verifies that the HWIO timer is counting up with the proper increment. Range Test (RaTe): When the run/crank is not active both the hardware and mirror timers are started. The timers are compared when module shutdown is initiated or run/crank becomes active.	Count Up Test: Time difference between the current read and the previous read of the timer Range Test: The variation of the HWIO timer and mirror timer is	> 1.50 seconds > 0.25 %.			Count Up Test: 4 failures out of 20 samples 1 sec / sample Continuous while run/crank is not active and until controller shutdown is initiated. Range Test: Once per trip when controller shutdown is initiated or run/ crank becomes active.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump "A" Low Flow / Performance	P2635	This DTC detects degradation in the performance of the electronically regulated fuel system	Filtered fuel rail pressure error	<= Low Threshold [Supporting Table] **P2635 Threshold Low** OR >= High Threshold [Supporting Table] **P2635 Threshold High**	a] Fuel Pres Sensor Circuit Low Fault Active (DTC P018C) b] Fuel Pres Sensor Circuit High Fault Active (DTC P018D) c] Fuel Pres Sensor Perf Fault Active (DTC P018B) d] Fuel Pump Circuit Low Fault Active (DTC P0231) e] Fuel Pump Circuit High Fault Active (DTC P0232) f] Fuel Pump Circuit Open Fault Active (DTC P023F) g] Reference Voltage Fault Status (DTC P0641) h] Fuel Pump Driver Control Module Overtemperature Fault Active (DTC P1255) j] Barometric Pressure Signal Valid (PPEI $4C1) k] Engine run time l] Emissions Fuel Level Low (PPEI $3FB) m] Fuel Pump Control Enabled	a] <> TRUE b] <> TRUE c] <> TRUE d] <> TRUE e] <> TRUE f] <> TRUE g] <> Active This Key h] <> TRUE j] == TRUE (for absolute fuel pressure sensor) k] >= 30 sec l] <> TRUE m] == TRUE	1 sample / 12.5 millisec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					n] Fuel Pump Control state p] System Voltage q] Fuel flow rate r] Fuel Pressure Control System	n] == Normal p] 11V< System V <32V q1] > 0.047 gram/sec AND q2] <= Max allowed fuel flow rate [Supporting Table] **P2635 Max Fuel Flow** r1] Not responding to overperformance due to pressure buildup during Deceleration Fuel Cut Off OR r2] Not responding to a decreasing desired fuel pres commnad		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Malfunction Indicator Lamp (MIL) Control Circuit (ODM) Low	P263A	Detects an inoperative malfunction indicator lamp control circuit. This diagnostic reports the DTC when a short to ground is detected.	Voltage low during driver off state (indicates short-to-ground)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Run/Crank Voltage Remote Vehicle Start is not active	Voltage ≥ 11.00 volts	1 failures out of 1 samples 50 ms / sample	Type B, No MIL NO MIL Note: In certain controllers P0650 may also set (MIL Control Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Malfunction Indicator Lamp (MIL) Control Circuit (ODM) High	P263B	Detects an inoperative malfunction indicator lamp control circuit. This diagnostic reports the DTC when a short to power is detected.	Voltage high during driver on state (indicates short to power)	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Run/Crank Voltage Remote Vehicle Start is not active	Voltage ≥ 11.00 volts	4 failures out of 5 samples 50 ms / sample	Type B, No MIL NO MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Chassis Control Module 1 Requested MIL Illumination	P26C8	Monitors the Chassis Contol Module 1 MIL request message to determine when the Chassis Control Module 1 has detected a MIL illuminating fault.	Chassis Control Module 1 Emissions-Related DTC set and module is requesting MIL	Chassis Control Module 1 Emissions-Related DTC set and module is requesting MIL		Time since power-up ≥ 3 seconds	Continuous	Type A, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Drive Pinion Circuit Open (12VSS)	P26E4	Controller specific output driver circuit diagnoses the Tandem Starter Pinion Relay high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground.	Starter relay pinion diag enable Engine speed Run Crank voltage	= 1.00 0.00 RPM 11.00 volts	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Drive Pinion Circuit Low Voltage (12VSS)	P26E5	Controller specific output driver circuit diagnoses the Tandem Starter Pinion Relay high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 0.5 Ohms impedance between signal and controller ground	Starter control diag enable Engine speed Run Crank voltage	= 1.00 0.00 RPM 6.41 volts	8 failures out of 10 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Drive Pinion Circuit High Voltage (12VSS)	P26E6	Controller specific output driver circuit diagnoses the Tandem Starter Pinion Relay high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 0.5 Ohms impedance between signal and controller power	Starter control diag enable Engine speed Run Crank voltage	= 1.00 0.00 RPM 11.00 volts	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 1 Low Voltage	P3051	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 1 for short to ground faults.	DC/DC Converter Actuator Voltage Raw Value 1	< 1 Volt	Diagnostic enabled Run/Crank or Accessory	TRUE TRUE	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 2 Low Voltage	P3052	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 2 for short to ground faults.	DC/DC Converter Actuator Voltage Raw Value 2	< 1 Volt	Diagnostic enabled Run/Crank or Accessory	TRUE TRUE	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 1 High Voltage	P3053	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 1 for short to battery faults.	DC/DC Converter Actuator Voltage Raw Value 1	> 28 Volt	Diagnostic enabled Run/Crank or Accessory	TRUE TRUE	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 2 High Voltage	P3054	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 2 for short to battery faults.	DC/DC Converter Actuator Voltage Raw Value 2	> 28 Volt	Diagnostic enabled Run/Crank or Accessory	TRUE TRUE	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage 1 Performance	P3055	Detects DC/DC Converter Actuator Voltage 1 Performance issues	Bypass Mode: Absolute value of voltage difference between DC/DC Converter Actuator Voltage Raw Value 1 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine running OR Engine stopped	TRUE TRUE for > 160 loops in 6.25 ms loop for > 160 loops in 6.25 ms loop	640 failed samples out of 800 samples in a 6.25 ms loop	Type B, 2 Trips
			Stabilize Mode- Auto-Cranking: Absolute value of voltage difference between DC/DC Converter Actuator Voltage Raw Value 1 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking	TRUE TRUE for > 0 loops in 6.25 ms loop	16 failed samples out of 32 samples in a 6.25 ms loop	
			Stablize Mode-Auto-Cranking Events: Number of failed auto-cranking events exceeds threshold	> 2 failed auto-cranking events	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking	TRUE TRUE has occurred	2 failed auto-crank events out of 3 consecutive auto-crank events	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage 2 Performance	P3056	Detects DC/DC Converter Actuator Voltage 2 Performance issues	Bypass Mode: Absolute value of voltage difference between DC/ DC Converter Actuator Voltage Raw Value 2 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine running OR Engine stopped	TRUE TRUE for > 160 loops in 6.25 ms loop for > 160 loops in 6.25 ms loop	640 failed samples out of 800 samples in a 6.25 ms loop	Type B, 2 Trips
			Stabilize Mode- Auto-Cranking: Absolute value of voltage difference between DC/ DC Converter Actuator Voltage Raw Value 2 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking	TRUE TRUE for > 0 loops in 6.25 ms loop	16 failed samples out of 32 samples in a 6.25 ms loop	
			Stablize Mode-Auto-Cranking Events: Number of failed auto-cranking events exceeds threshold	> 2 failed auto-cranking events	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking	TRUE TRUE has occurred	2 failed auto-crank events out of 3 consecutive auto-crank events	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Ignition Switch Run/ Start Position Ciruit High Voltage	P305B	Diagnoses the DC/DC Converter Ignition Switch Run/Start Position circuit for circuit high faults	DC/DC Converter Ignition Switch Run/Start Position	<> ECM Ignition Switch Run/Start Position	Diagnostic enabled Run/Crank Accessory	TRUE FALSE TRUE	320 failed samples out of 400 samples	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Ignition Switch Run/ Start Position Ciruit Low Voltage	P305C	Diagnoses the DC/DC Converter Switch Run/ Start Position circuit for circuit low faults	DC/DC Converter Ignition Switch Run/Start Position	<> ECM Ignition Switch Run/Start Position	Diagnostic enabled Run/Crank Accessory	TRUE TRUE TRUE	640 failed samples out of 800 samples	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Crank Control Circuit High Voltage	P305D	Diagnoses the DC/DC Converter Crank Control Circuit for circuit high faults	DC/DC Converter Crank Control	<> ECM Crank Control	Diagnostic enabled Run/Crank ECM Crank Control	TRUE TRUE FALSE	640 failed samples out of 800 samples	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Crank Control Circuit Low Voltage	P305E	Diagnoses the DC/DC Converter Crank Control Circuit for circuit low faults	DC/DC Converter Crank Control	<> ECM Crank Control	Diagnostic enabled Run/Crank or Accessory ECM Crank Control	TRUE TRUE TRUE	24 failed samples out of 32 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder Deactivation System Performance	P3400	Detects a performance failure in the cylinder deactivation system. This diagnostic will fail if one or more cylinders that has been commanded to deactivate does not deactivate. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates a modeled values of the Manifold Pressure (MAP) sensor using the Mass Air Flow (MAF) sensor. This is called the MAP2 Model. The MAP2 modeled value is compared against the actual MAP sensor values when all cylinders are active. An "all cylinder" MAP2 Model error is established with this comparison. When cylinders are deactivated, a "cylinder deactivation" MAP2 Model error is similarly established. If the "all cylinder" and "cylinder deactivation" MAP2 Model errors are similar, then air flow through the system	Current MAP Model 2 Error AND (All Cylinder MAP Model 2 Error) - (Current MAP Model 2 Error) Where: Current MAP Model 2 Error = (Measured MAP – MAP Model 2) Filtered Where: All Cylinder MAP Model 2 Error = (Measured MAP – MAP Model 2) Filtered stored the last time that all cylinders were active for a time greater than	< -6 kPa > -6 kPa > 2.0 seconds	**ReducedEngineCapacityMode_Enable** = TRUE for a time Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. No Active DTCs: No Pending DTCs:	> 2.0 seconds >= 0 RPM <= 6,900 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP	100 failures out of 200 samples Performed every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		when cylinders are deactivated is the expected value. All cylinders are properly deactivated. If these two MAP2 Model errors are not similar, then air flow through the system when cylinders are deactivated is different than the expected value. This indicates that a cylinder is pumping air when it should not. This cylinder is not properly deactivated. In this case, the Deactivation System Performance diagnostic will fail.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Deactivation Solenoid Control Circuit/Open	P3409	Controller specific output driver circuit diagnoses the Cylinder 2 Deactivation Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3411 may also set (Cylinder 2 Deactivation Solenoid Control Circuit/ Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Deactivation Solenoid Control Circuit/Low	P3411	Controller specific output driver circuit diagnoses the Cylinder 2 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3409 may also set (Cylinder 2 Deactivation Solenoid Control Circuit/ Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Deactivation Solenoid Control Circuit/High	P3412	Controller specific output driver circuit diagnoses the Cylinder 2 Deactivation Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 5 Deactivation Solenoid Control Circuit/Open	P3433	Controller specific output driver circuit diagnoses the Cylinder 5 Deactivation Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3435 may also set (Cylinder 5 Deactivation Solenoid Control Circuit/ Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 5 Deactivation Solenoid Control Circuit/Low	P3435	Controller specific output driver circuit diagnoses the Cylinder 5 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Controller specific output driver circuit diagnoses the Cylinder 3 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3433 may also set (Cylinder 5 Deactivation Solenoid Control Circuit/ Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 5 Deactivation Solenoid Control Circuit/High	P3436	Controller specific output driver circuit diagnoses the Cylinder 5 Deactivation Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication on Bus A Off	U0073	This DTC monitors for a BUS A off condition	Bus off failures exceeds	5 counts (equivalent to 0.06 seconds)	General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			before the sample time of is reached	0.81 seconds	Normal CAN transmission on Bus A	Enabled		
					Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					CAN hardware is bus OFF for	> 0.1625 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication on Bus B Off	U0074	This DTC monitors for a BUS B off condition	Bus off failures exceeds	5 counts (equivalent to 0.06 seconds)	General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
			before the sample time of is reached	0.81 seconds	Normal CAN transmission on Bus B	Enabled		
					Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					CAN hardware is bus OFF for	> 0.1625 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With TCM	U0101	This DTC monitors for a loss of communication with the transmission control module	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			Message $0BD	≥ 10.0 seconds	Normal CAN transmission on Bus A	Enabled		
			Message $0C7	≥ 10.0 seconds	Device Control	Not Active		
			Message $0F9	≥ 10.0 seconds				
			Message $189	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $199	≥ 10.0 seconds	Ignition Voltage Criteria:			
			Message $19D	≥ 10.0 seconds	Run/Crank Ignition voltage	> 6.41 Volts		
			Message $1AF	≥ 10.0 seconds				
			Message $1F5	≥ 10.0 seconds	Power Mode	= run		
			Message $4C9	≥ 10.0 seconds				
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for	> 0.4000 seconds		
					U0101	Not Active on Current Key Cycle		
					TCM	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Chassis Control Module A	U012A	This DTC monitors for a loss of communication with the Chassis Control Module A.	Message is not received from controller for Message $4DB	≥ 10.0 seconds	General Enable Criteria: U0073 Normal CAN transmission on Bus A Device Control High Voltage Virtual Network Management Ignition Voltage Criteria: Run/Crank Ignition voltage Power Mode Off Cycle Enable Criteria: KeCAND_b_OffKeyCycleDiagEnbl Ignition Accessory Line and Battery Voltage General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 1 (1 indicates enabled) = Active > 11.00 Volts > 0.4000 seconds	Diagnostic runs in 12.5 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					U012A	Not Active on Current Key Cycle		
					CHCM A	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Battery Monitor Module	U01B0	This DTC monitors for a loss of communication with the Battery Monitor Module on LIN bus	Message is not received from controller for ECM has lost communication over the LIN bus with Battery Monitor Module for	>= 3 counts	The following criteria have been enabled for	>= 400.00 milliseconds	Between 100ms and 175ms due to rate of LIN communication to Battery Monitor Module.	Type B, 2 Trips
					Power Mode	=Run		
					Run/Crank Voltage	>= 11.00 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication LIN Bus 1 Off	U1501	This DTC monitors for a LIN bus off condition	LIN bus off failures	>= 3.00 counts	The following criteria have been enabled for Power Mode Run/Crank Voltage	>= 400.00 milliseconds =Run >= 11.00 Volts	Dependent on bus loading.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Fuel Pump Driver Control Module	U18A2	This DTC monitors for a loss of communication with the Fuel Pump Driver Control Module on Bus B	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
			Message $0D5	≥ 10.0 seconds				
			Message $0D7	≥ 10.0 seconds	Normal CAN transmission on Bus B	Enabled		
					Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	=Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					U18A2	Not Active on Current Key Cycle		
					Fuel Pump Driver Control Module	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With DC/ DC Converter Control Module on Bus B	U18A7	This DTC monitors for a loss of communication with the DC/DC Converter Control Module on Bus B	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
			Message $0A0	≥ 10.0 seconds	Normal CAN transmission on Bus B	Enabled		
			Message $1D2	≥ 10.0 seconds	Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for	> 0.4000 seconds		
					U18A7	Not Active on Current Key Cycle		
					DC/DC Converter Control Module	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Lost Communication with ECM/PCM	U2616	To detect lost serial data communication from the power driver controller to the ECM	Timer - Fuel System Control message CAN $0D9 not received (FPPM Received Serial Data Communication Status)	t > 10 s (Fu Pmp Pwr Mod smart device reports Faulted, Not Faulted or Indeterminate)	a) FPPM configuration KeFRPR_e_ChassisFuelPresSysType b) Fault state determination enabled c) Run_Crank status d) FPPM Control Status Alive Rolling Count result e) FPPM Diagnostic feedback received f) System Voltage	a) == CeFRPR_e_ECM_FPPM_Sys b) == TRUE c) == Active d) == Valid e) == TRUE f) 9v < Sys Voltage > 32v	64 failures / 80 samples 1 sample / 12.5 millisec	Type B, 2 Trips

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 (end-park phaser)	P0016	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 1 sensor A occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	4 cam sensor pulses less than or greater than nominal position in one cam revolution.	-7.1 Crank Degrees 8.3 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	CrankSensor_FA P0340, P0341 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. There is a delay after the first failed test to allow the camshaft position to return to the park position. This time is defined by the table **P0016, P0017, P0018, P0019: Cam Correlation Oil Temperature Threshold** . One sample per cam rotation	Type B, 2 Trips

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 B (end-park phaser)	P0017	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 1 sensor B occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	4 cam sensor pulses less than or greater than nominal position in one cam revolution..	-8.4 Crank Degrees 9.2 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0365, P0366 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. There is a delay after the first failed test to allow the camshaft position to return to the park position. This time is defined by the table **P0016, P0017, P0018, P0019: Cam Correlation Oil Temperature Threshold** . One sample per cam rotation	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Composition Sensor Circuit Low	P0178	A continuous circuit Out-of-Range Low or Open fault is detected by monitoring the signal frequency of the Ethanol composition sensor The ethanol sensor is designed to measure ethanol concentrations from E0 (50Hz) to E100 (150Hz), with a specified accuracy of 5% ethanol (i.e. 5Hz). If the raw frequency value is less than the threshold value a fail counter will increment. When the correct ratio of failure counts vs. sample counts is achieved, the fault code is set.	Flex Fuel Sensor Output Frequency	< 45 Hertz	Powertrain Relay	> 11.00 Volts	50 failures out of 63 samples 100 ms loop Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Composition Sensor Circuit High	P0179	A continuous circuit Out-of-Range High fault is detected by monitoring the signal frequency of the Ethanol composition sensor The ethanol sensor is designed to measure ethanol concentrations from E0 (50Hz) to E100 (150Hz), with a specified accuracy of 5% ethanol (i.e. 5Hz). If the raw frequency value is greater than the threshold value a fail counter will increment. When the correct ratio of failure counts vs. sample counts is achieved, the fault code is set. If the frequency goes higher than the specified high conductivity threshold then a P2269 is set instead (see that monitor for full description)	Flex Fuel Sensor Output Frequency	> 155 Hertz <= 185	Powertrain Relay	> 11.00 Volts	50 failures out of 63 samples 100 ms loop Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow A Supply Voltage Control Circuit	P121A	Controller specific output driver circuit diagnoses the Mass Air Flow A Supply Voltage Control low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground	Mass Air Flow Power is commanded on Powertrain Relay Voltage	>= 11.0 Volts	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips Note: In certain controllers P121B may also set (Mass Air Flow A Supply Voltage Control Circuit Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow A Supply Voltage Control Circuit Low	P121B	Controller specific output driver circuit diagnoses the Mass Air Flow A Supply Voltage Control low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	Mass Air Flow A Power is commanded on Powertrain Relay Voltage	>= 11.0 Volts	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips Note: In certain controllers P121A may also set (Mass Air Flow A Supply Voltage Control Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow A Supply Voltage Control Circuit High	P121C	Controller specific output driver circuit diagnoses the Mass Air Flow A Supply Voltage Control low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	Mass Air Flow A Power is commanded off Powertrain Relay Voltage	>= 11.0 Volts	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Conductivity Out Of Range (water in fuel)	P2269	Detects the presence of High Conductivity Fuel (e.g. water in fuel) via a specific range of sensor frequency that is higher than the normal out of range high threshold. High conductivity in the fuel causes a significant upward shift in the sensor's output frequency and does not indicate a failure of the sensor or wiring, but instead is a failure of the fuel conditions which requires different repair for the vehicle. If the raw frequency value is greater than the conductivity threshold value a fail counter will increment. When the correct ratio of failure counts vs. sample counts is achieved, the fault code is set.	Flex Fuel Sensor Output Frequency	> 185 Hertz	Powertrain Relay	> 11.00 Volts	50 failures out of 63 samples 100 ms loop Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Powertrain Control Module (HPC) Requested MIL Illumination	P0AC4	Monitors the HPC MIL request message to determine when the HPC has detected a MIL illuminating fault.	HPC Module Emissions-Related DTC set and module is requesting MIL	HPC Module Emissions-Related DTC set and module is requesting MIL		Time since power-up ≥ 3 seconds	Continuous	Type A, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Control Torque Request Circuit	P15F2	Determines if torque request from the HCP is valid. This is done using a rolling count / protection fault for commanded engine torque.	1. Serial Communication 2’s complement not equal for message $181 for Strong Hybrid or Mild Hybrid Applications	Message <> 2's complement of Engine Torque Signal and if Mild Hybrid: Message <> 2's complement of Motor Torque Signal	Secondary High Speed Bus is Present and No Serial communication loss to HCP (U1817)	No loss of communication	1. >= 10 Protect errors out of 16 samples	Type A, 1 Trips
					Run Crank Active	>= 0.40 Sec		
					Ingintion Voltage > Threshold	> 6.41		
			OR	OR	No Serial communication loss to HCP (U1817)		OR	
			2. Serial Communication rolling count value shall be + 1 from previous $181 message for Strong Hybrid or Mild Hybrid Applications	Message rolling count value <> previous message rolling count value plus one	Hybrid Type = Mild, SS or Strong	= Mild	2. >= 10 Rolling count errors out of 16 samples Pass diagnostic if samples >= 16 Performed every received message	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Driver Motor Torque Delivered Circuit	P15F4	Determines if torque archieved from BCP is valid	1. Serial Communication 2's complement not equal for message $0BF for Mild Hybrid Applications OR 2. Serial Communication rolling count value shall be + 1 from previous $0BF message for Mild Hybrid Applications	Message <> 2's complement of Motor Torque Signal OR Message rolling count value <> previous message rolling count value plus one	Secondary High Speed Bus is Present and No Serial communication loss to BCP (U1817) Run Crank Active Low Voltage not Present	No loss of Communication >= 0.50 > 6.41	1. >= 10 Protect errors out of 16 samples OR 2. >= 10 Rolling count errors out of 16 samples Executes in a 12.5ms loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Control Speed Request Circuit	P15F9	Determines if torque request from the HCP is valid	1. Serial Communication 2's complement not equal for message $281 OR 2. Serial Communication rolling count value shall be + 1 from previous $281 message	Message <> 2's complement of message Message rolling count value <> previous message rolling count value plus one	Secondary High Speed Bus is Present No Serial communication loss to HCP (U1817) Run Crank Active	>= 0.50 Sec	>= 10.00 Password Protect errors out of 16.00 samples OR >= 10.00 Rolling count errors out of 16.00 samples Pass diagnostic if samples >= 16.00 Performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Signal Message Counter Incorrect	P15FB	Detects rolling count or protection value errors in Chassis Brake Pedal Position Emissions Related serial data signal	If x of y rolling count / protection value faults occur, default brake pedal positiion to zero for duration of fault		Chassis Brake Pedal Position Emissions Related Serial Data Error Diagnostic Enable	1.00	9.00 / 17.00 counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Shift Pending	P185F	Detects an error in the ECM transfer case shift pending command value relative to the ECM transfer case command state. The transfer case executes a shift out of 4WD high, 4WD low, or 4WD neutral using the ECM engine torque control and TCM holding clutch control to manage the torque on the transfer case input shaft. As the transfer case is executing one of these shifts, the state is considered “shift pending”. It is not possible for the transfer case to command both a “shift pending” and a constant 4WD high or 4WD low or 4WD neutral state; if this condition occurs the DTC is set.	trasnfer case shift pending AND transfer case commnd state OR trasnfer case shift pending AND transfer case commnd state OR trasnfer case shift pending AND transfer case commnd state OR trasnfer case shift pending AND transfer case commnd state update fail count when any OR condition occurs	= shift out of 4wd high = 4wd low = shift out of 4wd high = 4wd neutral = shift out of 4wd low = 4wd high = shift out of 4wd neutral = 4wd low	engine mode run run/crank voltage P2771 four wheel drive low circuit, fault fault active transfer case shift pending monitor delay time	= TRUE >= 9.00 volts = FALSE >= 5.00	>= 5 counts (one count per 25 milliseconds)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Powertrain Control Module (HPC) 2 Requested MIL Illumination	P1E00	Monitors the HPC 2 MIL request message to determine when the HPC has detected a MIL illuminating fault.	HPC 2 Module Emissions-Related DTC set and module is requesting MIL	HPC 2 Module Emissions-Related DTC set and module is requesting MIL		Time since power-up ≥ 3 seconds	Continuous	Type A, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Speed Sensor Output (TCSS)	P2160	The diagnostic monitor detects no activity in the TCSS circuit due to an electrical fault, wiring fault or sensor fault. The TCSS signal is rationalized against operating conditions of the vehicle. If the vehicle is in motion, accelerator pedal, engine torque, transmission in gear, and no vehicle braking, and the TCSS signal registers below a threshold, the DTC will set.	transfer case output shaft speed sesnor raw speed, update fail time	≤ 25.0 RPM	diagnotic monitor enable calibration transmission gear selector position AND engine torque AND engine torque NOT AND accelerator pedal position AND accelerator pedal position NOT transmission gear selector position AND engine torque AND engine torque NOT AND accelerator pedal position AND accelerator pedal position NOT run/crank voltage run/crank voltage run/crank voltage engine power limited PTO active engine speed transmission output shaft speed update range change delay time when condition A or condition B or condition C (25	= 1 Boolean = PARK OR NEUTRAL ≥ 8,191.75 Nm ≤ 8,191.75 Nm ≥ 100.00 % ≤ 8.00 % ≠ PARK AND ≠ NEUTRAL ≥ 80.00 Nm ≤ 35.00 ≥ 5.00 % ≤ 3.00 % ≥ 5.0 volts for 25 milliseconds ≥ 9.0 volts ≤ 32.0 volts = FALSE Boolean = FALSE Boolean ≥ 300.0 RPM ≥ 181.0 RPM	fail time ≥ 4.50 seconds 25 millisecond update rate range change delay time ≥	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					millisecond update rate): condition A: transmission range state transmission range state previous loop (25 millisecond) condition B: test when transmission range state is reverse enable calibration AND transmission range state transmission range state previous loop (25 millisecond) condition C: test when transmission range state is neutral enable calibration AND transmission range state transmission range state previous loop (25 millisecond) P2161 test fail this key on P2160 test fail this key on P2160 fault active DTCs not fault active	 = drive8 or less = drive8 or less = 0 Boolean = REVERSE = REVERSE = 0 Boolean = NEUTRAL = NEUTRAL = FALSE Boolean = FALSE Boolean = FALSE Boolean Transmission Output Shaft Angular Velocity Validity CrankSensor_FA EngineTorqueEstInaccurate	**P2160 range change delay time** seconds Refer to "Transmission Supporting Tables" for details	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Speed Sensor Output (TCSS)	P2161	The diagnostic monitor detects an unrealistic drop in the TCSS signal due to a sudden electrical fault, wiring fault or sensor fault. The TCSS signal is rationalized against operating conditions of the vehicle. If the vehicle is in motion, accelerator pedal, engine torque, transmission in gear, and no vehicle braking, and the TCSS signal drops above a delta threshold, a fail timer is enabled. When a TCSS drop occurs it is possible to enable the P2160 fail time as well as the PP2161 fail time. With both P2160 and P2161 fail timers active it is a race condition to either DTC.	transfer case speed sesnor raw speed delta, update fail time	≥ 650.0 RPM	diagnotic monitor enable calibration	= 1 Boolean	fail time ≥ 3.00 seconds, 25 millisecond update rate, increment fail count fail count ≥ 5 counts, 25 millisecond update rate	Type B, 2 Trips
					update range change delay time when condition A or condition B or condition C (25 millisecond update rate):		range change delay time ≥ **P2161 range change delay time** seconds Refer to "Transmission Supporting Tables" for details	
					condition A:			
					transmission range state	= drive8 or less		
					transmission range state previous loop (25 millisecond)	= drive8 or less		
					condition B:			
					test when transmission range state is reverse enable calibration	= 0 Boolean		
					AND			
					transmission range state	= REVERSE		
					transmission range state previous loop (25 millisecond)	= REVERSE		
					condition C:			
					test when transmission range state is neutral enable calibration	=0 Boolean		
					AND			
					transmission range state	= NEUTRAL		
					transmission range state previous loop (25 millisecond)	= NEUTRAL		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					run/crank voltage	≥ 5.0 volts for 25 milliseconds		
					run/crank voltage	≥ 9.0 volts		
					run/crank voltage	≤ 32.0 volts		
					PTO active	= FALSE Boolean		
					transfer case mode	≠ transfer case mode previos loop (25 millisecond) update 4WD range change time		
						4WD range change time	≥ 5.00 seconds	
					engine speed	≥ 500.0 RPM		
					transmission output shaft speed loop to loop delta (25 millisecond) AND	≤ 4,095.0 RPM		
					transmission output shaft speed	≥ 350.0 RPM		
					update stability time stability time	≥ 0.00 seconds		
					transfer case raw output speed AND	> 150.0 RPM		
					transfer case raw output speed last loop (25 millisecond)	> 150.0 RPM		
					update stability time stability time	≥ 6.00 seconds		
					P2160 test fail this key on	= FALSE		
					P2160 fault active	= FALSE		
					DTCs not fault active	CrankSensor_FA TransmissionEngagedState_FA Transmission Output Shaft Angular Velocity Validity		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Four Wheel Drive Low Switch Circuit	P2771	The 4WD low switch is used to indicate 4WD high or 4WD low as requested by the vehicle driver. Fail case 1: continuous open in which the 4WD low switch circuit indicates 4WD high ratio, not in 4WD low ratio, but the measured transfer case ratio is 4WD low ratio. Fail case 2: continuous ground short in which the 4WD low switch circuit indicates 4WD low ratio, not in 4WD high ratio, but the measured transfer case ratio is 4WD high ratio. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	fail case 1: 4WD low switch raw value transfer case measured gear ratio, update fail time 1 OR fail case 2: 4WD low switch raw value transfer case measured gear ratio, update fail time 2	= FALSE ≥ 2.600 and ≤ 2.800 = TRUE ≥ 0.900 and ≤ 1.100	diagnostic monitor enable engine torque engine torque engine speed engine speed ignition voltage (controller run crank ignition in range) throttle position without idle throttle position without idle transmission fluid temperature transmission fluid temperature engine run time vehicle speed transmission gear (auto trans) clutch pedal position (manual trans) DTCs not fault active	= 1 Boolean ≥ 80.0 Nm ≤ 8,191.8 Nm ≥ 2,000 RPM ≤ 5,500 RPM ≥ 11.00 volts ≥ 10.0 % ≤ 99.0 % ≥ -7.0 ºC ≤ 130.0 ºC ≥ 10.0 seconds ≥ 15.00 MPH = forward drive gear ≤ 12.0 % TPS_FA EngineTorqueEstInaccurate P0502, P0503, P0716, P0717, P07BF, P07C0 P0722, P0723, P215B, P215C, P2160, P2161, U0101	fail time 1 ≥ 2.0 seconds, increment fail count 1, fail count 1 ≥ 1 counts fail time 2 ≥ 7.0 seconds, increment fail 2 count, fail 2 count ≥ 1 counts fail time an fail count 100 milliseond update rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4wd high command not 4wd high ratio	P279A	Monitor measured transfer case gear ratio is 4WD low ratio or neutral while the transfer case control module command state is 4WD high. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	measured transfer case ratio is 4wd high ratio AND measured transfer case ratio calculation updated, update weighted fail and sample count (measured transfer case ratio = transmission output speed / transfer case output speed) update rate 12.5 milliseconds	= FALSE = TRUE	transfer case contol module transfer case command state	= 4wd high	weighted fail count >= 5 out of sample count >= 280 update rate 12.5 milliseconds, 12.5 milliseconds per count	Type A, 1 Trips
					weighted fail count	= **P279A P279B P279C Transfer Case Control Module Transfer Case Command State Rationality (weighting factor)** (see supproting table)		
					measured transfer case ratio is 4wd high ratio set to TRUE AND measured tranfer case ratio calculation updated set to TRUE	measured transfer case ratio >= **P279A Transfer Case Control Module Transfer Case Command State Rationality (margin of error low)** (see supporting table) AND measured transfer case ratio <= **P279A Transfer Case Control Module Transfer Case Command State Rationality (margin of error high)** (see supporting table)		
					transfer case output speed sensor configuration = CeFWDD_e_UseTCSS_AndWheelSpeeds	transfer case output speed sensor configuration = CeFWDD_e_UseTCSS = not fault active		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P2160 or P2161 transfer case measured speed else transfer case measured speed OR transfer case output speed sensor configuration = CeFWDD_e_UseTCSS P2160 or P2161 transfer case measured speed vehicle drive wheel type configuration NOT CeFWDG_e_No_AWD_Or_FWD AND NOT CeFWDG_e_Versatrak_AWD AND NOT CeFWDG_e_FWD_AWD_SingleSpd not DTCs fault active	= transfer case speed sensor signal = driven wheel speed sensor signal value * axle ratio = CeFWDD_e_UseTCSS = not fault active = transfer case speed sensor signal vehicle drive wheel type configuration = CeFWDR_e_FWD_ECM_TCM_TCCM P0502, P0503, P0722, P0723, P2160, P2161		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4wd low command not 4wd low ratio	P279B	Monitor measures transfer case gear ratio is 4WD high ratio or neutral while the transfer case control module command state is 4WD low. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	measured transfer case ratio is 4wd low ratio AND measured transfer case ratio calculation updated, update weighted fail and sample count (measured transfer case ratio = transmission output speed / transfer case output speed) update rate 12.5 milliseconds	= FALSE = TRUE	transfer case contol module transfer case command state	= 4wd low	weighted fail count >= 5 out of sample count >= 280 update rate 12.5 milliseconds, 12.5 milliseconds per count	Type A, 1 Trips
					weighted fail count	= **P279A P279B P279C Transfer Case Control Module Transfer Case Command State Rationality (weighting factor)** (see supproting table)		
					measured transfer case ratio is 4wd low ratio set to TRUE AND measured tranfer case ratio calculation updated set to TRUE	measured transfer case ratio >= **P279B Transfer Case Control Module Transfer Case Command State Rationality (margin of error low)** (see supporting table) AND measured transfer case ratio <= **P279B Transfer Case Control Module Transfer Case Command State Rationality (margin of error high)** (see supporting table)		
					transfer case output speed sensor configuration = CeFWDD_e_UseTCSS_AndWheelSpeeds P2160 or P2161	transfer case output speed sensor configuration = CeFWDD_e_UseTCSS = not fault active = transfer case speed		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					transfer case measured speed else transfer case measured speed OR transfer case output speed sensor configuration = CeFWDD_e_UseTCSS P2160 or P2161 transfer case measured speed vehicle drive wheel type configuration NOT CeFWDG_e_No_AWD_Or_FWD AND NOT CeFWDG_e_Versatrak_AWD AND NOT CeFWDG_e_FWD_AWD_SingleSpd not DTCs fault active	sensor signal = driven wheel speed sensor signal value * axle ratio transfer case output speed sensor configuration = CeFWDD_e_UseTCSS = not fault active = transfer case speed sensor signal vehicle drive wheel type configuration = CeFWDR_e_FWD_ECM_TCM_TCCM P0502, P0503, P0722, P0723, P2160, P2161		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4wd neutral command not 4wd neutral ratio	P279C	Monitor measured transfer case gear ratio is 4WD high ratio or 4WD low ratio while the transfer case control module command state is 4WD neutral. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	measured transfer case ratio is 4wd neutral ratio AND measured transfer case ratio calculation updated, update weighted fail and sample count (measured transfer case ratio = transmission output speed / transfer case output speed) update rate 12.5 milliseconds	= FALSE = TRUE	transfer case contol module transfer case command state neutral rationality enabled weighted fail count measured transfer case ratio is 4wd neutral ratio set to TRUE AND measured tranfer case ratio calculation updated set to TRUE when ratio check 1 AND ratio check 2	= 4wd neutral = 1 Boolen = **P279A P279B P279C Transfer Case Control Module Transfer Case Command State Rationality (weighting factor)** (see supproting table) ratio check 1: measured transfer case ratio >= **P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error high 1)** (see supporting table) OR measured transfer case ratio <= **P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error low 1)** ratio check 2 measured transfer case ratio >=	weighted fail count >= 5 out of sample count >= 280 update rate 12.5 milliseconds, 12.5 milliseconds per count	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					transfer case output speed sensor configuration = CeFWDD_e_UseTCSS_AndWheelSpeeds P2160 or P2161 transfer case measured speed else transfer case measured speed OR transfer case output speed sensor configuration = CeFWDD_e_UseTCSS P2160 or P2161 transfer case measured speed vehicle drive wheel type configuration NOT CeFWDG_e_No_AWD_Or_FWD AND NOT CeFWDG_e_Versatrak_AWD	**P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error high 2)** (see supporting table) OR measured transfer case ratio <= **P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error low 2)** transfer case output speed sensor configuration = CeFWDD_e_UseTCSS = not fault active = transfer case speed sensor signal = driven wheel speed sensor signal value * axle ratio transfer case output speed sensor configuration = CeFWDD_e_UseTCSS = not fault active = transfer case speed sensor signal vehicle drive wheel type configuration = CeFWDR_e_FWD_ECM_TCM_TCCM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					AND NOT CeFWDG_e_FWD_AWD_SingleSpd not DTCs fault active	P0502, P0503, P0722, P0723, P2160, P2161		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Hybrid Powertrain Control Module	U0293	This DTC monitors for a loss of communication with the Hybrid Powertrain Control Module.	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			Message $0B4	≥ 10.0 seconds				
			Message $0D3	≥ 10.0 seconds	Normal CAN transmission on Bus A	Enabled		
			Message $186	≥ 10.0 seconds	Device Control	Not Active		
			Message $1DF	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $3C1	≥ 10.0 seconds				
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for U0293 Hybrid Powertrain Control Module	> 0.4000 seconds Not Active on Current Key Cycle is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Hybrid Powertrain Control Module B	U179A	This DTC monitors for a loss of communication with the Hybrid Powertrain Control Module B	Message is not received from controller for	≥ 10.0 seconds	General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0073	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus A	Enabled		
					Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and Battery Voltage	= Active > 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for	> 0.4000 seconds		
					U179A	Not Active on Current Key Cycle		
					Hybrid Powertrain Control Module B	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Hybrid Powertrain Control Module on Bus B	U1817	This DTC monitors for a loss of communication with the Hybrid Powertrain Control Module on Bus B	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0074	Not Active on Current Key Cycle		
			Message $0A7	≥ 10.0 seconds				
			Message $1E3	≥ 10.0 seconds	Normal CAN transmission on Bus B	Enabled		
			Message $281	≥ 10.0 seconds				
					Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		
					U1817	Not Active on Current Key Cycle		
					Hybrid Powertrain Control Module	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4WD high or 4WD low command not 4wd high or 4WD low ratio	P17D4	The diagnostic monitor compares measured transfer case ratio to the transfer case control module commanded transfer case state. When the measured transfer case gear ratio is 4WD neutral ratio, while, the transfer case control module command state is 4WD high ratio or 4WD low ratio, the DTC is set. The 4WD neutral ratio regions are considered ratios outside the nominal 4WD high and nominal 4WD low ratios. The 4WD ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	transfer case contol module transfer case command state AND measured transfer case ratio is NOT in 4WD low ratio window AND measured transfer case ratio is NOT in 4WD high window AND measured transfer case ratio is NOT in 4WD low ratio window AND measured transfer case ratio is NOT in 4WD high window OR vehicle is stopped: transfer case output shaft speed transmission output shaft speed vehicle stopped secondary parameter thresholds met (measured transfer case ratio = transmission output speed / transfer case output speed)	≠ 4WD neutral 4WD low ratio window ≤ 3.00 ≥ 2.40 4WD high ratio window ≤ 1.30 ≥ 0.70 ≥ 2.90 ≤ 2.00 ≥ 1.20 ≤ 0.80 ≤ 10.0 RPM ≥ 500.0 RPM	vehicle stopped: transmission output shaft speed engine torque engine speed accelerator pedal position accelerator pedal position brake pedal position transmssion gear is forward gear: transmission output shaft speed engine torque engine speed accelerator pedal position accelerator pedal position brake pedal position transmssion gear is reverse gear: transmission output shaft speed engine torque engine speed accelerator pedal position accelerator pedal position brake pedal position diagnsotic monitor enable PTO active engine power limited DTCs not fault active	≥ 500.0 RPM ≥ 100.0 Nm ≥ 300.0 RPM ≥ 5.0 % hysteresis high NOT ≤ 3.0 % hysteresis low ≤ 100.0 % ≥ 500.0 RPM ≥ 0.0 Nm ≥ 0.0 RPM ≥ 0.0 % hysteresis high NOT ≤ 0.0 % hysteresis low ≤ 100.0 % ≥ 500.0 RPM ≥ 90.0 Nm ≥ 300.0 PRM ≥ 6.0 % hysteresis high NOT ≤ 3.0 % hysteresis low ≤ 100.0 % = 1 Boolean = FALSE = FALSE CrankSensor_FA VehicleSpeedSensor_FA EngineTorqueEstInaccurate P057B, P057C, P057D,	fail time ≥ 10.50 seconds out of sample time ≥ 15.00 seconds update rate 12.5 milliseconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			update fail time update rate 12.5 milliseconds			P057E, P279A, P279B, P279C, P0502, P0503, P0722, P0723, P2160, P2161		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Radiator Coolant Temp Sensor Circuit Low Voltage	P00B3	Circuit Continuity This DTC detects a short to ground in the RCT (Radiator Coolant temperature) signal circuit or the RCT sensor. This is accomplished by monitoring the resitance of the circuit. If the resistance goes out of the expected range the DTC is set.	RCT Resistance (@ 150ºC)	< 45 Ohms	Engine run time OR IAT min	> 0.0 seconds ≤ 150.0 °C	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Radiator Coolant Temp Sensor Circuit High Voltage	P00B4	Circuit Continuity This DTC detects a short to high or open in the RCT (Radiator Coolant temperature) signal circuit or the RCT sensor. This is accomplished by monitoring the resistance of the circuit. If the resistance goes out of the expected range the DTC is set.	RCT Resistance (@ -60ºC)	> 200,000 Ohms	Engine run time OR IAT min	> 60.0 seconds ≥ -7.0 °C	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 Open Circuit - (PFI)	P0201	This DTC Diagnoses Injector 1 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 K Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0261 may also set (Injector 1 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 Open Circuit - (PFI)	P0202	This DTC Diagnoses Injector 2 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0264 may also set (Injector 2 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 Open Circuit - (PFI)	P0203	This DTC Diagnoses Injector 3 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0267 may also set (Injector 3 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 Open Circuit - (PFI)	P0204	This DTC Diagnoses Injector 4 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0270 may also set (Injector 4 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 Open Circuit - (PFI)	P0205	This DTC Diagnoses Injector 5 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0273 may also set (Injector 5 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 Open Circuit - (PFI)	P0206	This DTC Diagnoses Injector 6 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0276 may also set (Injector 6 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 Open Circuit - (PFI)	P0207	This DTC Diagnoses Injector 7 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0279 may also set (Injector 7 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 Open Circuit - (PFI)	P0208	This DTC Diagnoses Injector 8 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Open circuit: >= 200 KΩ impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0282 may also set (Injector 8 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 Low side circuit shorted to ground (PFI)	P0261	This DTC Diagnoses Injector 1 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0201 may also set (Injector 1 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 1 Low side circuit shorted to power (PFI)	P0262	This DTC Diagnoses Injector 1 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 Low side circuit shorted to ground (PFI)	P0264	This DTC Diagnoses Injector 2 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0202 may also set (Injector 2 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 2 Low side circuit shorted to power (PFI)	P0265	This DTC Diagnoses Injector 2 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 Low side circuit shorted to ground (PFI)	P0267	This DTC Diagnoses Injector 3 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0203 may also set (Injector 3 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 3 Low side circuit shorted to power (PFI)	P0268	This DTC Diagnoses Injector 3 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 Low side circuit shorted to ground (PFI)	P0270	This DTC Diagnoses Injector 4 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0204 may also set (Injector 4 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 4 Low side circuit shorted to power (PFI)	P0271	This DTC Diagnoses Injector 4 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 Low side circuit shorted to ground (PFI)	P0273	This DTC Diagnoses Injector 4 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0205 may also set (Injector 5 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 5 Low side circuit shorted to power (PFI)	P0274	This DTC Diagnoses Injector 5 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 Low side circuit shorted to ground (PFI)	P0276	This DTC Diagnoses Injector 6 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0206 may also set (Injector 6 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 6 Low side circuit shorted to power (PFI)	P0277	This DTC Diagnoses Injector 6 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 Low side circuit shorted to ground (PFI)	P0279	This DTC Diagnoses Injector 7 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0207 may also set (Injector 7 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 Low side circuit shorted to power (PFI)	P0280	This DTC Diagnoses Injector 7 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 Low side circuit shorted to ground (PFI)	P0282	This DTC Diagnoses Injector 8 low side driver circuit for circuit faults.	Voltage low during driver off state indicates short-to-ground or open circuit	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips Note: In certain controllers P0208 may also set (Injector 8 Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 Low side circuit shorted to power (PFI)	P0283	This DTC Diagnoses Injector 8 low side driver circuit for circuit faults.	Voltage high during driver on state indicates short to power	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage within range for a duration Engine Running	>= 11.00 Volts >= 5 Seconds >= 0 Seconds	50.00 failures out of 63.00 samples 100 ms /sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor Not Plausible) (TSRD	P111E	This DTC detects either a biased high or low ECT (Engine Coolant temperature) sensor. This is done by comparing the ECT sensor output to two other temperature sensor outputs after a soak condition.	**Sensor usage definitions:** **Sensor1 =** CeECTD_e_ECT_Snsr (Sensor1 is the temp sensor most impacted by the block heater (if equipped)) **Sensor2 =** CeECTD_e_RCT_Snsr **Sensor3 =** CeECTD_e_IAT_Snsr =================== A failure will be reported if any of the following occur: 1) Sensor1 power up absolute temp difference to Sensor2 and Sensor3 is (Sensor1 fast fail) . 2) Sensor1 power up temp is greater than Sensor2 and Sensor3 in this range: (and a block heater has not been detected) 3) Sensor1 power up temp is lower than Sensor2 and Sensor3 by this amount: 4) Sensor1 power up temp is ≥ Sensor2 and	≥ 50.0 ºC ≥ 19.3 and < 50.0 ºC ≤ 19.3 Deg ºC	No Active DTC's Engine Off Soak Time Propulsion Off Soak Time Non-volatile memory initization Test complete this trip Test aborted this trip Test disabled this trip Ambient LowFuelCondition Diag ================== Block Heater detection is **enabled** when either of the following occurs: 1) Sensor1 power up temp is greater than Sensor2 and Sensor3 in this range: 2) Cranking time ================== Block Heater is **detected**	VehicleSpeedSensor_FA IAT_SensorCircuitFA THMR_RCT_Sensor_Ckt_FA ECT_Sensor_Ckt_FA EngineModeNotRunTimerError EngineModeNotRunTimer_FA OAT_PtEstFiltFA OAT_PtEstRawFA PSAR_PropSysInactveCrs_FA DRER_DiagSystemDsbl > 28,800 seconds > 0 seconds = Not occurred = False = False = False ≥ -7 ºC = False ================== ≥ 19.3 ºC and < 50.0 ºC < 10.0 Seconds ==================	1 failure to set DTC 1 sec/ sample Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Sensor3 by 19.3 ºC and the time spent cranking the engine without starting is ≥ 10.0 seconds with the LowFuelConditionDiag	= False	and diagnostic is aborted when 1) or 2) occurs. 1a) IAT monitoring is enabled after the following Vehicle drive constraints 1b) Drive time 1c) Vehicle speed 1d) Additional Vehicle drive time is provided to 1b when Vehicle speed is below 1c as follows: 1e) IAT drops from power up IAT 2a) ECT monitoring is enabled after engine start in the following engine run time window 2b) Sensor1 temp derivative during the test is: 2c) Consectutive samples of 2b) being true are: ================= Diagnostic is **aborted** when 3) or 4) occurs: 3) Engine run time with vehicle speed below 1b 4) Engine off time (i.e. auto stop) during Block heater detection	> 400 Seconds with > 14.9 MPH and 0.00 times the seconds with vehicle speed below 1b ≥ 3.3 ºC 5.0 <= seconds <= 60.0 < -0.12 ºC/sec ≥ 4 samples ================== ≥ 1,800 Seconds ≥ 180.0 Seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Radiator Coolant Temperature Sensor Not Plausible) (TSRD	P112F	This DTC detects either a biased high or low RCT (Radiator Coolant Temperature) sensor. This is done by comparing the RCT sensor output to two other temperature sensor outputs after a soak condition.	**Sensor usage definitions:** **Sensor1 =** CeECTD_e_ECT_Snsr (Sensor1 is the temp sensor most impacted by the block heater (if equipped)) **Sensor2 =** CeECTD_e_RCT_Snsr **Sensor3 =** CeECTD_e_IAT_Snsr ================== A failure will be reported if (based on the above calibrations): 1) Sensor2 (if RCT is Sensor2)power up absolute temp difference to Sensor1 and Sensor3 is: OR (based on usage) 2) Sensor3 (if RCT is Sensor3) power up absolute temp difference to Sensor1 and Sensor2 is:	≥ 19.3 ºC ≥ 19.3 ºC	No Active DTC's Engine Off Soak Time Propulsion Off Soak Time Non-volatile memory initization Test complete this trip Test aborted this trip Test disabled this trip Ambient LowFuelCondition Diag	VehicleSpeedSensor_FA IAT_SensorCircuitFA THMR_RCT_Sensor_Ckt_FA ECT_Sensor_Ckt_FA EngineModeNotRunTimerError EngineModeNotRunTimer_FA OAT_PtEstFiltFA OAT_PtEstRawFA PSAR_PropSysInactveCrs_FA DRER_DiagSystemDsbl > 28,800 seconds > 0 seconds = Not occurred = False = False = False ≥ -7 ºC = False	1 failure to set DTC 1 sec/ sample Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Replicated Transmission Output Speed (RTOS) Sensor	P150A	The diagnostic monitor detects no activity in the RTOS circuit due to an electrical fault, wiring fault or sensor fault. The RTOS signal is rationalized against operating conditions of the vehicle. If the vehicle is in motion, accelerator pedal, engine torque, transmission in gear, and no vehicle braking, and the RTOS signal registers below a threshold, the DTC will set.	RTOS Sensor Raw Speed, update fail time	≤ 60 RPM	diagnostic monitor enable transmission output speed angular velocity engine epeed engine speed vehicle speed crank diag enable: igntion voltage controller run crank active: ignition voltage ignition voltage P150A fault active OR P150A test fail this key on P150B test fail this key on DTCs not fault active	= 1 Boolean ≥ 500 RPM ≥ 200 RPM ≤ 7,500 RPM ≤ 512.0 KPH ≥ 5.0 volts ≥ 9.0 volts ≤ 32.0 volts = FALSE = FALSE = FALSE P0502, P0503, P0722, P0723, U0101	≥ 4.5 sec 100 millisecond update rate ≥ 5.0 seconds ≥ 5.0 seconds ≥ 25 milliseconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Replicated Transmission Output Speed (RTOS) Sensor	P150B	The diagnostic monitor detects an unrealistic drop in the RTOS signal due to a sudden electrical fault, wiring fault or sensor fault. The RTOS signal is rationalized against operating conditions of the vehicle. If the vehicle is in motion, accelerator pedal, engine torque, transmission in gear, and no vehicle braking, and the RTOS signal drops above a delta threshold, a fail timer is enabled. When a RTOS drop occurs it is possible to enable the P150A fail time as well as the P150B fail time. With both P150A and PP150B fail timers active it is a race condition to either DTC.	RTOS Sensor Loop-to-Loop speed change 25 millisecond update rate, update fail time	≥ 350 RPM	diagnostic monitor enable transmission output speed angular velocity engine epeed engine speed vehicle speed crank diag enable: igntion voltage controller run crank active: ignition voltage ignition voltage transmission output speed angular velocity last valid RTOS sensor raw speed OR RTOS sensor raw speed RTOS sensor raw speed positove change DTCs not fault active	= 1 Boolean ≥ 500.0 RPM ≥ 200.0 RPM ≤ 7,500.0 RPM ≤ 512.0 KPH ≥ 5.0 volts ≥ 9.0 volts ≤ 32.0 volts ≥ 500 RPM > 300.0 RPM > 300.0 RPM ≤ 150.0 RPM P0502, P0503, P0722, P0723, U0101	≥ 3.0 seconds 25 millisecond update rate ≥ 5.00 seconds ≥ 5.00 seconds ≥ 25 milliseconds ≥ 2.00 seconds ≥ 2.00 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling System Performance	P2181	This DTC detects a stuck open thermostat by comparing the ECT sensor reading with the Radiator Coolant Temperature (RCT) sensor reading while the thermostat is expected to be closed (ie: during warm up). If the sensors follow each other the DTC is set.	This diagnostic can be calibrated to fail in one of two methods based on the following calibration. This application has been calibrated as a Type 0 . Type 0 - Airflow Method: Engine Coolant Temp (ECT) is ≤ commanded temperature minus 11 Deg C and normalized ratio is ≤ than 1.25 . When above is present for more than 0 seconds, fail counts start. == Ratio Definition:=== Current temp difference between ECT and RCT minus PwrUp difference divided by total airgrams. Note: Minimum total airgrams is 500.0 grams. Type 1 - Energy Method: Engine Coolant Temp (ECT) is ≤ commanded temperature minus 11 Deg C and normalized ratio is ≤ than 1.25 . When above is present for more than 0 seconds, fail counts start. == Ratio Definition:=== Current temp difference between ECT and RCT minus PwrUp difference divided by predicted energy.		No Active DTC's Engine not run time Engine run time Fuel Condition ECT at Power Up IAT min T-Stat Heater duty cycle commanded Type 0: Airflow range to accumulate Type 1: Minumum energy to enable	MAF_SensorFA IAT_SensorFA THMR_RCT_Sensor_Ckt_FA THMR_ECT_Sensor_Ckt_FA THMR_AHV_FA ≥ 1,800 seconds 30 ≤ Time ≤ 1,370 seconds Ethanol ≤ 87 % -10.0 ≤ ECT ≤ 70.0 °C -7 °C ≤ IAT ≤ 55 °C. ≤ 20 % 25.0 ≤ Airflow ≤ 450.0 gps 250.0 kJ	75 failures out of 100 samples 1 sec/ sample Once per ignition key cycle	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 1 Performance (For use on vehicles with electric transfer pump dual fuel tanks)	P0461	This DTC will detect a fuel sender stuck in range in the primary fuel tank.	****************************** Fuel Level in Primary and Secondary Tanks Remain in an Unreadable Range too Long ****************************** This subtest is not used If fuel volume in primary tank is and fuel volume in secondary tank is and remains in this condition for of fuel consumed by the engine. OR ****************************** During Fuel Transfer ****************************** During fuel transfer, when the enable conditions are met, at least 5.0 liters of fuel will be transferred from the secondary tank and 5.0 liters of fuel will be transferred into the primary tank within 300 seconds. There is a short delay of 20 seconds to allow fuel slosh to settle before the fail timer begins. If the secondary	≥ 1,024.0 liters < 0.0 liters 18.0 liters	Engine Running No active DTCs: Transfer pump is commanded on for the maximum time limit referenced in **P0461 P2066 P2636 Transfer Pump Enable Time Table** (see Supporting Table) No device control for the transfer pump Fuel Volume in Secondary Tank	 VehicleSpeedSensor_FA < 136 liters	250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			tank volume does decrease by the cal amount but the primary volume does not increase by the cal amount after the fail timer has expired, then P0461 sets. OR ****************************** Fuel consumed without a Primary Fuel Level Change ****************************** Delta fuel volume change for of fuel consumed by the engine.	 < 3 liters 27.3 liters	Vehicle Speed	< 0 mph		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Performance (For use on vehicles with electric transfer pump dual fuel tanks)	P2066	This DTC will detect a fuel sender stuck in range in the secondary fuel tank.	****************************** Fuel Level in Primary and Secondary Tanks Remains in an Unreadable Range too Long ****************************** This subset is not used If fuel volume in primary tank is and fuel volume in secondary tank is and remains in this condition for of fuel consumed by the engine. OR ****************************** During fuel transfer ****************************** When the enable conditions are met, 5.0 liters of fuel will be transferred from the secondary tank and 5.0 liters of fuel will be transferred into the primary tank within 300 seconds. There is a short delay of 20 seconds to allow fuel slosh to settle before the fail timer	≥ 1,024.0 liters < 0.0 liters 18.0 liters	Engine Running No active DTCs: Transfer pump is commanded on for the maximum time limit referenced in **P0461 P2066 P2636 Transfer Pump Enable Time Table** (see Supporting Table) No device control for the transfer pump Fuel volume in secondary tank	 VehicleSpeedSensor_FA < 136 liters	250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			begins. If the secondary tank volume does not decrease by the cal amount but the primary volume does increase by the cal amount after the fail timer has expired, then P2066 sets. OR ****************************** After a Refuel Event ****************************** If the primary fuel volume changes by 1,024 liters from engine “off” to engine “on” the secondary volume should change by 5 liters. Otherwise, P2066 will set. OR ****************************** Fuel consumed without a Secondary Fuel Level Change ****************************** If the vehicle is driven with the fuel consumed by the engine of without the secondary fuel level changing by 5 liters, then the sender must be stuck. OR ****************************** Stuck Above Secondary Full During Fuel Transfer ****************************** The secondary fuel level	30 liters > 136 liters	Vehicle Speed Volume in secondary tank Volume in secondary tank	< 0 mph ≥ 7 liters < 136 liters		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND If the vehicle is driven with the fuel consumed by the engine of without the secondary fuel level changing by 5 liters, then the sender must be stuck.	30 liters	Secondary Fuel Transfer Pump On Time	≥ 600 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump 2 Flow Insufficient (For use on vehicles with electric transfer pump dual fuel tanks)	P2636	This DTC detects if there is insufficient fuel flow from the secondary to the primary tank for 2 conditions: 1. when transferring fuel from the secondary tank or 2. when volume level value remains high too long	Primary Tank Level Change calibration, 5.0 liters After Time [If the secondary tank volume does not decrease by the cal amount and the primary volume does not increase by the cal amount after the fail timer has expired, then the DTC sets]	<> Secondary Tank Level Change calibration, 5.00 liters = 300.00 seconds	Primary Fuel Pump Device Control Secondary Fuel Tank Level Pump Commanded On Time [Transfer pump is commanded on for the maximum time limit referenced in Supporting Table] No active DTCs:	Enabled Not Active < 136 liters > [Supporting Table] **P0461 P2066 P2636 Transfer Pump Enable Time Table** seconds FuelLevelDataFault	Secondary Fuel Transfer Pump on for 300 seconds	Type A, 1 Trips
			Secondary tank fuel level volume remains for more than Time [Secondary Fuel Tank Level remains in an unreadable range too long]	> 136 liters = 300.00 seconds	Device Control Primary Fuel Pump Transfer Pump On Time No active DTCs:	Not Enabled Enabled > 600 seconds FuelLevelDataFault	Secondary Fuel Transfer Pump on for 300 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Catalyst System Low Efficiency Bank 1	P0420	NOTE: The information contained below applies to applications that use the Idle Catalyst Monitor Algorithm 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 Normalized Ratio OSC Value Calculation Information and Definitions = 1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time) 2. BestFailing OSC value from a calibration table (based on temp and exhaust gas flow)	Normalized Ratio OSC Value (EWMA filtered)	< 0.35	There must be a valid idle period. The criteria are: Driver must be off the accel pedal. This checks that the final accel pedal position (comprehending deadband and hysteresis) is essentially zero. Idle Speed Control System Is Active Vehicle Speed Engine speed Engine run time Tests attempted this trip The catalyst diagnostic has not yet completed for the current trip. Catalyst Idle Conditions Met Criteria is satified which includes the General Enable met and the Valid Idle Period	 < 1.24 MPH > 1,100 RPM for a minimum of 25 seconds since end of last idle period. > **CatmonMinEngineRunTimeToEnable** This is a function of Coolant Temperature, please see "Supporting Tables" for details. < 255	1 test attempted per valid idle period Minimum of 1 test per trip Maximum of 8 tests per trip Frequency: Fueling Related : 12.5 ms OSC Measurements: 100 ms Temp Prediction: 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		3. WorstPassing OSC value (based on temp and exhaust gas flow) Normalized Ratio Calculation = (1-2) / (3-2) A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part.The Catalyst Monitoring Test is done during idle. Several conditions must be meet in order to execute this test. These conditions and their related values are listed in the secondary parameters area of this document. Refer to the **P0420_WorstPassing OSCTableB1** and **P0420_BestFailingOS CTableB1** table in the **Supporting Tables** tab for details			Criteria met, as well as: Green Converter Delay Induction Air Intrusive test(s): Fueltrim Post O2 EVAP EGROther vehicle functions: Power Take Off RunCrank Voltage Ethanol Estimation ECT Barometric Pressure Idle Time before going intrusive is Idle time is incremented if Vehicle speed Short Term Fuel Trim	Not Active > -20 ° C < 250 ° C Not Active Not Active > 10.90 Volts NOT in Progress > 50 ° C < 130 ° C > 70 KPA < 50 Seconds < 1.24 MPH and the drivers foot is off accel pedal and the idle speed control system is active as identified in the Valid Idle Period Criteria section. > 0.90 < 1.30		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Predicted catalyst temp	> 600.00 degC		
					AND			
					Engine Airflow	> **CatmonMinAirflowForWarmCatalystDetermination** table (g/s) (refer to "Supporting Tables" tab) (Based on engine coolant at the time the WarmedUpEvents counter resets to 0.)		
					for at least	28 seconds		
					with a closed throttle time	< 120 seconds consecutively (closed throttle consideration involves having the driver off the accel pedal as stated in the Valid Idle Period Criteria Section) .		
					Also, in order to increment the WarmedUpEvents counter, either the vehicle speed must exceed the vehicle speed cal or the driver must NOT be off the accel pedal as stated in the Valid Idle Period Criteria section above.			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Closed loop fueling (Please see "Closed Loop Enable Criteria" section of the "Supporting Tables" tab for details.)			
					PRNDL	Enabled in Drive Range on an Auto Transmission vehicle.		
					Idle Stable Criteria:	Must hold true from after Catalyst Idle Conditions Met to the end of test		
					MAF	> 2.50 g/s < 11.00 g/s		
					Predicted catalyst temperature	< 900 degC		
					Engine Fueling Criteria at Beginning of Idle Period The following fueling related must also be met from between 4 and 7 seconds after the Catalyst Idle Conditions Met Criteria has been met for at least 4 seconds prior to allowing intrusive control:			
					Number of pre-O2 switches	>= 2		
					Short Term Fuel Trim Avg	> 0.96 < 1.04		
					Rapid Step Response			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					(RSR) feature will initiate multiple tests: If the difference between current EWMA value and the current OSC Normalized Ratio value is and the current OSC Normalized Ratio value is Maximum RSR tests to detect failure when RSR is enabled. Green Converter Delay Criteria This is part of the check for the Catalyst Idle Conditions Met Criteria section The diagnostic will not be enabled until the following has been met: Predicted catalyst temperature for Note: this feature is only enabled when the vehicle is new and cannot be enabled in service PTO General Enable DTC's Not Set	 > 0.46 < 0.10 24 > 0 ° C 0 seconds non-continuously. Not Active MAF_SensorFA MAF_SensorTFTKO AmbPresDfltdStatus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						IAT_SensorCircuitFA IAT_SensorCircuitTFTKO ECT_Sensor_FA O2S_Bank_1_Sensor_1_FA O2S_Bank_1_Sensor_2_FA O2S_Bank_2_Sensor_1_FA O2S_Bank_2_Sensor_2_FA FuelTrimSystemB1_FA FuelTrimSystemB1_TFTKO FuelTrimSystemB2_FA FuelTrimSystemB2_TFTKO EngineMisfireDetected_FA EvapPurgeSolenoidCircuit_FA IAC_SystemRPM_FA EGRValvePerformance_FA EGRValveCircuit_FA CamSensorAnyLocationFA CrankSensor_FA TPS_Performance_FA EnginePowerLimited		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Pressure Measurement System - Multiple Sensor Correlation (supercharged)	P00C7	Detects an inconsistency between pressure sensors in the induction system in which a particular sensor cannot be identified as the failed sensor. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Manifold Pressure (MAP), Supercharger Inlet Pressure (SCIAP) and Barometric Pressure (BARO) sensors values are checked to see if they are within the normal expected atmospheric pressure range. If they are, then MAP, SCIAP and BARO are compared to see if their values are similar. If two of these three sensors are similar, but the third is not, then a performance diagnostic for the specific sensor with the dissimilar value will fail. If there is no combination of two of these three sensors	ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold	> 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating Manifold Pressure Manifold Pressure Baro Pressure Baro Pressure Supercharger Inlet Pressure Supercharger Inlet Pressure No Active DTCs: No Pending DTCs:	> 8.0 seconds >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa EngineModeNotRunTimer Error MAP_SensorFA SCIAP_SensorFA AAP2_SnsrFA MAP_SensorCircuitFP SCIAP_SensorCircuitFP AAP2_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		that is similar, then the failed sensor cannot be uniquely identified. The Multiple Pressure Sensor Correlation Diagnostic will fail in this case.	Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure)	> 10.0 kPa > 10.0 kPa				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow System Performance (supercharged)	P0101	Detects a performance failure in the Mass Air Flow (MAF) sensor, such as when a MAF value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Supercharger Inlet Pressure (SCIAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAF sensor. In this case, the MAF Performance diagnostic	See table **P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. TPS model fails when Filtered Throttle Model Error MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered SCIAP1 model fails when ABS(Measured SCIAP – SCIAP Model 1) Filtered SCIAP2 model fails when ABS(Measured SCIAP – SCIAP Model 2) Filtered	> 400 kPa*(g/s) > 30.0 grams/sec > 30.0 kPa > 30.0 kPa > 25.0 kPa > 25.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,200 RPM >= -7 Deg C = TRUE) <= 129 Deg C >= -20 Deg C <= 129 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		will fail.			-	MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** SCIAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** SCIAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP2 Residual Weight Factor based on RPM** and		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost		
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA SCIAP_SensorCircuitFA AmbientAirDefault		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP SCIAP_SensorCircuitFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Performance (supercharged)	P0106	Detects a performance failure in the Manifold Pressure (MAP) sensor, such as when a MAP value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The MAP sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the MAP performance diagnostic will fail. If the MAP sensor value is within the normal expected atmospheric range, then MAP, Supercharger Inlet Absolute Pressure (SCIAP), and Barometric Pressure (BARO) are compared to see if their values are similar. If the SCIAP and BARO sensor values are similar, but the MAP value is not similar, then a MAP performance diagnostic will fail.	**<u>Engine Running:</u>** See table **P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. TPS model fails when Filtered Throttle Model Error MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered SCIAP1 model fails when ABS(Measured SCIAP – SCIAP Model 1) Filtered SCIAP2 model fails when ABS(Measured SCIAP – SCIAP Model 2) Filtered	> 400 kPa*(g/s) > 30.0 grams/sec > 30.0 kPa > 30.0 kPa > 25.0 kPa > 25.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,200 RPM >= -7 Deg C = TRUE) <= 129 Deg C >= -20 Deg C <= 129 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost**	Continuous Calculation are performed every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, Supercharger Inlet Pressure (SCIAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAP sensor. In this case, the MAP Performance diagnostic will fail.				MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** SCIAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** SCIAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP2 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA SCIAP_SensorCircuitFA AmbientAirDefault		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP SCIAP_SensorCircuitFP		
			Engine Not Rotating:		Time between current ignition cycle and the last time the engine was running	> 8.0 seconds	4 failures out of 5 samples 1 sample every 12.5 msec	
			Manifold Pressure OR Manifold Pressure	< 50.0 kPa > 115.0 kPa	Engine is not rotating			
			OR					
			ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure)	> 10.0 kPa > 10.0 kPa <= 10.0 kPa	No Active DTCs: No Pending DTCs:	EngineModeNotRunTimerError MAP_SensorFA SCIAP_SensorFA AAP2_SnsrFA MAP_SensorCircuitFP SCIAP_SensorCircuitFP AAP2_SnsrCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Circuit Low (Gen II)	P0107	Detects a continuous short to ground or open circuit in the Manifold Absolute Pressure (MAP) signal circuit by monitoring the MAP sensor output voltage and failing the diagnostic when the MAP voltage is too low. The MAP sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	MAP Voltage	< 3.0 % of 5 Volt Range (This is equal to 0.15 Volts or -19.8 kPa)	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Circuit High (Gen II)	P0108	Detects a continuous short to power in the Manifold Absolute Pressure (MAP) signal circuit by monitoring the MAP sensor output voltage and failing the diagnostic when the MAP voltage is too high. The MAP sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	MAP Voltage	> 90.0 % of 5 Volt Range (This is equal to 4.50 Volts, or 350.0 kPa)	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature (ECT) Sensor Performance	P0116	This DTC detects an ECT (Engine Coolant temperature) sensor that is biased high or stuck above the thermostat monitoring diagnostic. This check is performed after a soak condition.	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 28,800 second soak (fast fail). 2) ECT at power up > IAT at power up by 19.3 C after a minimum 28,800 second soak and a block heater has not been detected. 3) ECT at power up > IAT at power up by 19.3 C after a minimum 28,800 seconds soak and the time spent cranking the engine without starting is greater than 10.0 seconds with the LowFuelConditionDiag	See **P0116_Fail if power up ECT exceeds IAT by these values** in the Supporting tables section = False	No Active DTC's Non-volatile memory initization Test complete this trip Test aborted this trip IAT LowFuelCondition Diag ================== Block Heater detection is enabled when either of the following occurs: 1) ECT at power up > IAT at power up by 2) Cranking time ================== Block Heater is detected and diagnostic is aborted when 1) or 2) occurs: 1a) Vehicle drive time 1b) Vehicle speed 1c) Additional Vehicle drive time is provided to 1a when Vehicle speed is below 1b as follows:	VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_Ckt_FA IgnitionOffTimeValid TimeSinceEngineRunning Valid = Not occurred = False = False ≥ -7 ºC = False ================== > 19.3 ºC < 10.0 seconds ================== > 400 seconds with > 15 MPH 0.00 times the seconds with vehicle speed below 1b	1 failure 500 msec/ sample Once per valid cold start	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					1d) IAT drops from power up IAT 2a) ECT drops from power up ECT 2b) Engine run time =================== Diagnostic is aborted when 3) or 4) occurs: 3) Engine run time with vehicle speed below 1b 4) Minimum IAT during test	≥ 3.3 ºC ≥ 1 ºC Within ≤ 30 seconds ================== > 1800 seconds ≤ -7 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Sensor Performance (supercharg ed)	P0121	Detects a performance failure in the Throttle Position sensor (TPS) sensor, such as when a TPS value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Supercharger Inlet Pressure (SCIAP) sensor and Mass Air Flow (MAF) sensor. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the TPS sensor. In this case, the TPS	See table **P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. TPS model fails when Filtered Throttle Model Error MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered SCIAP1 model fails when ABS(Measured SCIAP – SCIAP Model 1) Filtered SCIAP2 model fails when ABS(Measured SCIAP – SCIAP Model 2) Filtered	> 400 kPa*(g/s) > 30.0 grams/sec > 30.0 kPa > 30.0 kPa > 25.0 kPa > 25.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,200 RPM >= -7 Deg C = TRUE) <= 129 Deg C >= -20 Deg C <= 129 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Performance diagnostic will fail.			-	MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** SCIAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** SCIAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP2 Residual Weight Factor based on RPM** and		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost		
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA SCIAP_SensorCircuitFA AmbientAirDefault		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP SCIAP_SensorCircuitFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Supercharger Inlet Absolute Pressure (SCIAP) Sensor Performance	P012B	Detects a performance failure in the Supercharger Inlet Absolute Pressure (SCIAP) sensor, such as when a SCIAP value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The SCIAP sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the SCIAP performance diagnostic will fail. If the SCIAP sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), SCIAP and Barometric Pressure (BARO) are compared to see if their values are similar. If the MAP and BARO sensor values are similar, but the SCIAP value is not similar, then a SCIAP performance diagnostic will fail. The engine running portion of this	**<u>Engine Running:</u>** See table **P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. TPS model fails when Filtered Throttle Model Error MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered SCIAP1 model fails when ABS(Measured SCIAP – SCIAP Model 1) Filtered SCIAP2 model fails when ABS(Measured SCIAP – SCIAP Model 2) Filtered	> 400 kPa*(g/s) > 30.0 grams/sec > 30.0 kPa > 30.0 kPa > 25.0 kPa > 25.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,200 RPM >= -7 Deg C = TRUE) <= 129 Deg C >= -20 Deg C <= 129 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, Manifold Pressure (MAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the SCIAP sensor. In this case, the SCIAP Performance diagnostic will fail.				MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM**		
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA SCIAP_SensorCircuitFA AmbientAirDefault		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP SCIAP_SensorCircuitFP		
			<u>Engine Not Rotating:</u> Supercharger Inlet		Time between current ignition cycle and the last time the engine was		4 failures out of 5 samples	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Pressure OR Supercharger Inlet Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure)	< 50.0 kPa > 115.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	running Engine is not rotating No Active DTCs: No Pending DTCs:	> 8.0 seconds EngineModeNotRunTimerError MAP_SensorCircuitFA SCIAP_SensorCircuitFA AAP2_SnsrCktFA MAP_SensorCircuitFP SCIAP_SensorCircuitFP AAP2_SnsrCktFP	1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Supercharger Inlet Absolute Pressure (SCIAP) Sensor Circuit Low (Gen II)	P012C	Detects a continuous short to ground or open circuit in the Supercharger Inlet Absolute Pressure (SCIAP) signal circuit by monitoring the SCIAP sensor output voltage and failing the diagnostic when the SCIAP voltage is too low. The SCIAP sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	SCIAP Voltage	< 3.0 % of 5 Volt Range (This is equal to 0.15 Volts, or 3.5 kPa)	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Supercharger Inlet Absolute Pressure (SCIAP) Sensor Circuit High (Gen II)	P012D	Detects a continuous short to power in the Supercharger Inlet Absolute Pressure (SCIAP) signal circuit by monitoring the SCIAP sensor output voltage and failing the diagnostic when the SCIAP voltage is too high. The SCIAP sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	SCIAP Voltage	> 97.0 % of 5 Volt Range (This is equal to 4.85 Volts, or 124.0 kPa)	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Slow Response Bank 1 Sensor 1) (For use with ESPD and w/o WRAF	P0133	This DTC determines if the Bank 1 primary O2 sensor has a slow response (in the Rich to Lean (R2L) or Lean to Rich (L2R) direction) and thereby can no longer be used for closed loop fuel control based on emission correlation testing. This diagnostic runs passively (see enable conditions) and monitors the time the O2 sensor signal is between an upper and lower voltage thresholds over the sample period. The diagnostic also monitors the O2 sensor signal for the number of Slope Time (ST) switches in each direction between the same upper and lower voltage thresholds over the sample period. When the required data is collected, an average R2L and L2R response time and individual R2L and L2R Slope Time (ST) switch count is calculated. This fault is set when the L2R and R2L response test results are compared to the	Fault condition present when the average response time is caluclated over the test time, and compared to the threshold. OR Slope Time L/R Switches OR Slope Time R/L Switches	Refer to **P0133_O2S Slow Response Bank 1 Sensor 1 Pass/Fail Threshold table** in the Supporting Tables tab < 3 < 3 The test averages the signal response time over 60.0 seconds when the signal is transitioning between 300 mvolts and 600 mvolts. An average rich to lean time and lean to rich time are each calculated separately. Note: the table listed above uses the following calibratable X axis: **P0133_KnEOSD_t_ST_LRC_LimRS1** and calibratable Y axis: **P0133_KnEOSD_t_ST_RLC_LimRS1**	No Active DTC's Bank 1 Sensor 1 DTC's not active System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault Green O2S Condition	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA Ethanol Composition Sensor FA EngineMisfireDetected_FA P0131, P0132, P0134 > 10.0 Volts = Not active = Not active = Not active = Not active = False = False = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than	Sample time is 60 seconds Frequency: Once per trip	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		"P0133_O2S Slow Response Bank 1 Sensor 1 "Pass/Fail Threshold Table" and the outcome determines a response faulted condition. Additionally, this fault is set when the L2R or R2L slope time switch count test results are less than the ST individual thresholds.				**Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec.		
					O2 Heater on for	≥ 40 seconds		
					Learned Htr resistance	= Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's")		
					Engine Coolant	> 50 ºC		
					(Or OBD Coolant Enable Criteria	= TRUE)		
					IAT	> -40 ºC		
					Engine run Accum	> 30 seconds		
					Time since any AFM status change	> 2.0 seconds		
					Time since Purge On to Off change	> 1.0 seconds		
					Time since Purge Off to On change	> 2.0 seconds		
					Engine airflow	15 ≤ grams/sec ≤ 55		
					Engine speed	1,000 ≤ RPM ≤ 3,000		
					Fuel Condition	< 87 % Ethanol		
					Baro	> 70 kpa		
					Air Per Cylinder	≥ 175 mGrams		
					Fuel Control State	= Closed Loop		
					Closed Loop Active	= TRUE (Please see “**Closed Loop Enable**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					 LTM (Block Learn) fuel cell Transient Fuel Mass Baro Fuel Control State Fuel State Commanded Proportional Gain ================== All of the above met for	**Clarification**" in Supporting Tables). = Enabled, refer to **Multiple DTC Use - Response Cell Enable Table** for additional info. ≤ 100.0 mgrams = Not Defaulted not = Power Enrichment DFCO not active ≥ 0.0 % ================== > 3.5 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Slow Response Bank 2 Sensor 1) (For use with ESPD and w/o WRAF	P0153	This DTC determines if the Bank 2 primary O2 sensor has a slow response (in the Rich to Lean (R2L) or Lean to Rich (L2R) direction) and thereby can no longer be used for closed loop fuel control based on emission correlation testing. This diagnostic runs passively (see enable conditions) and monitors the time the O2 sensor signal is between an upper and lower voltage thresholds over the sample period. The diagnostic also monitors the O2 sensor signal for the number of Slope Time (ST) switches in each direction between the same upper and lower voltage thresholds over the sample period. When the required data is collected, an average R2L and L2R response time and individual R2L and L2R Slope Time (ST) switch count is calculated. This fault is set when the L2R and R2L response test results are compared to the	Fault condition present when the average response time is caluclated over the test time, and compared to the threshold. OR Slope Time L/R Switches OR Slope Time R/L Switches	Refer to **P0153_O2S Slow Response Bank 2 Sensor 1 Pass/Fail Threshold table** in the Supporting Tables tab < 3 < 3 The test averages the signal response time over 60.0 seconds when the signal is transitioning between 300 mvolts and 600 mvolts. An average rich to lean time and lean to rich time are each calculated separately. Note: the table listed above uses the following calibratable X axis: **P0153_KnEOSD_t_ST_LRC_LimRS2** and calibratable Y axis:	No Active DTC's Bank 2 Sensor 1 DTC's not active System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault Green O2S Condition	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA Ethanol Composition Sensor FA EngineMisfireDetected_FA = P0151, P0152 or P0154 > 10.0 Volts = Not active = Not active = Not active = Not active = False = False = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than	Sample time is 60 seconds Frequency: Once per trip	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		"P0153_O2S Slow Response Bank 1 Sensor 1 "Pass/Fail Threshold Table" and the outcome determines a response faulted condition. Additionally, this fault is set when the L2R or R2L slope time switch count test results are less than the ST individual thresholds.		**P0153_KnEOSD_t_ST_RLC_LimRS2**	 O2 Heater on for Learned Htr resistance Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Time since any AFM status change Time since Purge On to Off change Time since Purge Off to On change Engine airflow Engine speed Fuel Condition Baro Air Per Cylinder Fuel Control State Closed Loop Active	**Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 40 seconds = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") > 50 ºC = TRUE) > -40 ºC > 30 seconds > 2.0 seconds > 1.0 seconds > 2.0 seconds 15 ≤ grams/sec ≤ 55 1,000 ≤ RPM ≤ 3,000 < 87 % Ethanol > 70 kpa ≥ 175 mGrams = Closed Loop = TRUE (Please see "**Closed Loop Enable Clarification**" in		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					LTM (Block Learn) fuel cell Transient Fuel Mass Baro Fuel Control State Fuel State Commanded Proportional Gain ================ All of the above met for	Supporting Tables). = Enabled, refer to **Multiple DTC Use - Response Cell Enable Table** for additional info. ≤ 100.0 mgrams = Not Defaulted not = Power Enrichment DFCO not active ≥ 0.0 % ================ > 3.5 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Pressure Sensor Out of Range High	P0193	This DTC diagnose the analog high pressure sensor 1 that is too high out of range. If the sensor voltage is above the upper voltage threshold, the high fail counter then increments. If the high fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	High Pressure Fuel Sensor Voltage	>= 95 % of 5Vref	SIDI High Pressure Sensor 1 Out of Range Time Based enabled SIDI High Pressure Sensor 1 Out of Range Time Based enabled Battery Voltage	True False >= 11 Volts Engine Running	Both Run Continuously Engine Synchronous Mode 800 failures out of 1,000 samples 8 samples per engine rotation Time Based Mode 400 failures out of 500 samples 6.25 ms Sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 Open Circuit - (SIDI)	P0207	Controller specific output driver circuit diagnoses Injector 7 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 7 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 Open Circuit - (SIDI)	P0208	Controller specific output driver circuit diagnoses Injector 7 low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. Or Controller specific output driver circuit diagnoses Injector 7 high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit. Or Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground >= 200 KOhms impedance between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Intercooler Coolant Pump Control Circuit If Intercooler pump are present	P023A	Controller specific output driver circuit diagnoses the 'charged air cooler pump' low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 200 K Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 6.00 Volts *****************************	50 failures out of 63 samples 100ms / sample	Type B, 2 Trips Note: In certain controllers P023B may also set turbo/ super charger intercooler coolant pump control circuit low

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Intercooler Coolant Pump Control Circuit Low If Intercooler pump are present	P023B	Controller specific output driver circuit diagnoses the 'charged air cooler pump' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller ground	Diagnostic enabled ****************************** Powertrain relay voltage Ignition run crank voltage ****************************** Engine is not cranking Diagnostic System not Disabled	True ****************************** >= 11.0 Volts > 6.00 Volts ******************************	50 failures out of 63 samples 100ms / sample	Type B, 2 Trips Note: In certain controllers P023A may also set turbo/ super charger intercooler coolant pump control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Intercooler Coolant Pump Control Circuit High If Intercooler pump are present	P023C	Controller specific output driver circuit diagnoses the 'charged air cooler pump' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller power	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 6.00 Volts *****************************	50 failures out of 63 samples 100ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 Low side circuit shorted to ground (SIDI)	P0279	Controller specific output driver circuit diagnoses Injector 7 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 <= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 Low side circuit shorted to power (SIDI)	P0280	Controller specific output driver circuit diagnoses Injector 7 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 Low side circuit shorted to ground (SIDI)	P0282	Controller specific output driver circuit diagnoses Injector 8 low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 1 volt between signal and controller ground	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 Low side circuit shorted to power (SIDI)	P0283	Controller specific output driver circuit diagnoses Injector 8 low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #7 CIRCUIT	P0357	Diagnoses Cylinder #7 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #8 CIRCUIT	P0358	Diagnoses Cylinder #8 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Output Speed Sensor (TOSS)	P0502	The diagnostic monitor detects no activity in the TOSS circuit due to an electrical fault, wiring fault or sensor fault. The TOSS signal is rationalized against operating conditions of the vehicle. If the vehicle is in motion, accelerator pedal, engine torque, transmission in gear, and no vehicle braking, and the TOSS signal registers below a threshold, the DTC will set.	transmission output speed raw, update fail time	≤ 60 RPM	service mode $04 active diagnostic monitor enable PTO active ignition voltage (controller run crank ignition in range) engine load enable occurs when: (accelerator pedal position engine torque) engine load disable occurs when: (accelerator pedal position engine torque OR accelerator pedal position engine torque) brake pedal position brake pedal position engine speed engine speed P0503 test fail this key on if clutch pedal is enabled clutch pedal position clutch pedal position P0502 test fail this key on OR P0502 fault active DTCs not fault active	= FALSE = 1 Boolean = FALSE ≥ 11.00 volts ≥ 12.0 % ≥ 50.0 Nm ≤ 6.0 % ≤ 30.0 Nm > 6.0 % ≤ 30.0 Nm ≤ 1.90 % < 80.0 % ≥ 1,500 RPM ≤ 6,500 RPM = FALSE = 1 Boolean ≥ 89.0 % >84.0 % = FALSE = FALSE AcceleratorPedalFailure EngineTorqueEstInaccurate	fail time ≥ 4.5 seconds 100 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Output Speed Sensor (TOSS)	P0503	The diagnostic monitor detects an unrealistic drop in the TOSS signal due to a sudden electrical fault, wiring fault or sensor fault. The TOSS signal is rationalized against operating conditions of the vehicle. If the vehicle is in motion, accelerator pedal, engine torque, transmission in gear, and no vehicle braking, and the TOSS signal drops above a delta threshold, a fail timer is enabled. When a TOSS drop occurs it is possible to enable the P0502 fail time as well as the P0503 fail time. With both P0502 and P0503 fail timers active it is a race condition to either DTC.	raw transmssion output speed current loop - raw transmssion output speed previous loop, 25 millisecond update rate	≥ delta fail threshold RPM	service mode $04 active diagnostic monitor enable PTO active ignition voltage (controller run crank ignition in range)	= FALSE = 1 Boolean = FALSE ≥ 11.00 volts	fail time ≥ 3.250 seconds, increment fail count, fail count ≥ 5 counts 25 millisecond update rate	Type A, 1 Trips
					4WD range current loop, update 4WD range time	≠ 4WD range previous loop	4wd range time ≥ 6.00 seconds	
					raw transmission output speed OR last valid transmision output speed before delta drop, update transmission output speed active time	≥ 300.0 RPM ≥ 300.0 RPM	transmission output speed active time ≥ 2.00 seconds	
					25 millisecond loop to loop transmision output speed positive delta, update transmission output speed stable time	≤ 150.0 RPM	transmission output speed stable time ≤ 2.000 seconds	
					P0503 fault active OR P0503 test fail this key on	= FALSE = FALSE		
					if shift lever position is enable: (shift lever position previous loop AND shift lever position current loop) OR shift lever position current loop, update shift lever position stablity time	= 1 Boolean = NEUTRAL = IN GEAR = IN GEAR	shift lever position stablity time ≥ 0.500	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							seconds	
					P0503 fault pending	= TRUE		
					delta fail threshold	= 650.0 RPM		
					P0503 fault pending	= FALSE		
					clutch pedal position	≥ 89.00 %		
					select delta fail threshold where mesaured ratio = TISS/TOSS:			
					1st gear			
					mesaured ratio	≥ 3.910		
					mesaured ratio	≤ 4.490		
					delta fail threshold,	= 800.0 RPM		
					mesaured ratio	≤ 3.910		
					mesaured ratio	≥ 2.800		
					delta fail threshold,	= 800.0 RPM		
					2nd gear			
					mesaured ratio	≥ 2.440		
					mesaured ratio	≤ 2.800		
					delta fail threshold,	= 750.0 RPM		
					mesaured ratio	≤ 2.440		
					mesaured ratio	≥ 1.930		
					delta fail threshold,	= 750.0 RPM		
					3rd gear			
					mesaured ratio	≥ 1.670		
					mesaured ratio	≤ 1.930		
					delta fail threshold,	= 700.0 RPM		
					mesaured ratio	≤ 1.670		
					mesaured ratio	≥ 1.390		
					delta fail threshold,	= 700.0 RPM		
					4th gear			
					mesaured ratio	≥ 1.210		
					mesaured ratio	≤ 1.390		
					delta fail threshold,	= 700.0 RPM		
					mesaured ratio	≤ 1.210		
					mesaured ratio	≥ 1.070		
					delta fail threshold,	= 700.0 RPM		
					5th gear			
					mesaured ratio	≥ 0.930		
					mesaured ratio	≤ 1.070		
					delta fail threshold,	= 700.0 RPM		
					mesaured ratio	≤ 0.930		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					mesaured ratio delta fail threshold, 6th gear mesaured ratio mesaured ratio delta fail threshold, mesaured ratio mesaured ratio delta fail threshold, 7th gear mesaured ratio mesaured ratio delta fail threshold, otherwise delta fail threshold P0503 fault pending clutch pedal position delta fail threshold	≥ 0.845 = 700.0 RPM ≥ 0.735 ≤ 0.845 = 650.0 RPM ≤ 0.735 ≥ 0.514 = 650.0 RPM ≥ 0.446 ≤ 0.514 = 650.0 RPM = 650.0 RPM = FALSE ≤ 84.00 % = 650.0 RPM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature Sensor Circuit Low Voltage	P0712	Controller specific analog circuit diagnoses the transmission fluid temperature sensor and wiring for a short to ground fault by comparing a voltage measurement to controller specific voltage thresholds, converted to a resistance value.	circuit resistance, update fail time	≤ 17.88 Ohms	diagnostic monitor enable P0712 fault active OR P0712 test fail this key on vehicle load for non-hybrid only: Engine speed AND Engine speed AND vehicle speed crank diag enable: igntion voltage controller run crank active: ignition voltage AND igntion voltage	= 1 Boolean = FALSE = FALSE ≥ 200.0 RPM ≤ 7,500.0 RPM ≤ 512.0 KPH ≥ 6.00 volts ≥ 9.0 volts ≤ 32.0 volts	>= 12.00 seconds for both fail thresholds 250 millisecond update rate ≥ 5.000 seconds ≥ 5.000 seconds ≥ 25 milliseconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature Sensor Circuit High Voltage	P0713	Controller specific analog circuit diagnoses the transmission fluid temperature sensor and wiring for an open circuit or short to power failure by comparing a voltage measurement to controller specific voltage thresholds, converted to a resistance value.	circuit resistance, update fail time	≥ 420,000.00 Ohms	diagnostic monitor enable P0713 fault active OR P0713 test fail this key on vehicle load for non-hybrid only: Engine speed AND Engine speed AND vehicle speed crank diag enable: igntion voltage controller run crank active: ignition voltage igntion voltage vehicle speed TCC slip speed DTCs not fault active	= 1 Boolean = FALSE = FALSE ≥ 200.0 RPM ≤ 7,500.0 RPM ≤ 512.0 KPH ≥ 6.00 volts ≥ 9.0 volts ≤ 32.00 volts ≥ 30.0 KPH ≥ -4,096.0 RPM P0502, P0503, P0722, P0723, P077D, P0716, P0717, P07BF, P07C0	>= 80.00 seconds for both fail thresholds 250 millisecond update rate ≥ 5.000 seconds ≥ 5.000 seconds ≥ 25 milliseconds ≥ 200.0 seconds ≥ 200.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 6 incorrect ratio	P0729	Detects when the N/V gear ratio indicates 6th gear but the Gear Position Sensor does not indicate 6th gear	Gear Position Sensor	≠ Gear 6	Gear Position Sensor learn status	= Learned	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips
					Ignition voltage Ignition voltage	≥ 9.00 volts ≤ 32.00 volts		
					Engine Torque Inaccurate	= False		
					Engine actual torque	≥ 50.00 Nm		
					Transmission output speed	≥ 120.00 rpm		
					Throttle position	≥ 8.00 Pct		
					Clutch pedal displacement	≤ 10.00 Pct		
					If four wheel drive low AND Transmission gear ratio Transmission gear ratio	= TRUE ≥ 5.00 ratio < 5.50 ratio		
					If four wheel drive low AND Transmission gear ratio Transmission gear ratio	= FALSE ≥ 0.64 ratio < 0.71 ratio		
					The above conditions are met for	≥ 1.50 seconds		
					DTC's not fault active	TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 1 incorrect ratio	P0731	Detects when the N/V gear ratio indicates 1st gear but the Gear Position Sensor does not indicate 1st gear	Gear Position Sensor	≠ Gear 1	Gear Position Sensor learn status Ignition voltage Ignition voltage Engine Torque Inaccurate Engine actual torque Transmission output speed Throttle position Clutch pedal displacement If four wheel drive low AND Transmission gear ratio Transmission gear ratio If four wheel drive low AND Transmission gear ratio Transmission gear ratio The above conditions are met for DTC's not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts = False ≥ 50.00 Nm ≥ 120.00 rpm ≥ 8.00 Pct ≤ 10.00 Pct = TRUE ≥ 5.00 ratio < 5.50 ratio = FALSE ≥ 2.18 ratio < 2.37 ratio ≥ 1.50 seconds TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 2 incorrect ratio	P0732	Detects when the N/V gear ratio indicates 2nd gear but the Gear Position Sensor does not indicate 2nd gear	Gear Position Sensor	≠ Gear 2	Gear Position Sensor learn status Ignition voltage Ignition voltage Engine Torque Inaccurate Engine actual torque Transmission output speed Throttle position Clutch pedal displacement If four wheel drive low AND Transmission gear ratio Transmission gear ratio If four wheel drive low AND Transmission gear ratio Transmission gear ratio The above conditions are met for DTC's not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts = False ≥ 50.00 Nm ≥ 120.00 rpm ≥ 8.00 Pct ≤ 10.00 Pct = TRUE ≥ 5.00 ratio < 5.50 ratio = FALSE ≥ 1.53 ratio < 1.69 ratio ≥ 1.50 seconds TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 3 incorrect ratio	P0733	Detects when the N/V gear ratio indicates 3rd gear but the Gear Position Sensor does not indicate 3rd gear	Gear Position Sensor	≠ Gear 3	Gear Position Sensor learn status Ignition voltage Ignition voltage Engine Torque Inaccurate Engine actual torque Transmission output speed Throttle position Clutch pedal displacement If four wheel drive low AND Transmission gear ratio Transmission gear ratio If four wheel drive low AND Transmission gear ratio Transmission gear ratio The above conditions are met for DTC's not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts = False ≥ 50.00 Nm ≥ 120.00 rpm ≥ 8.00 Pct ≤ 10.00 Pct = TRUE ≥ 5.00 ratio < 5.50 ratio = FALSE ≥ 1.15 ratio < 1.26 ratio ≥ 1.50 seconds TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 4 incorrect ratio	P0734	Detects when the N/V gear ratio indicates 4th gear but the Gear Position Sensor does not indicate 4th gear	Gear Position Sensor	≠ Gear 4	Gear Position Sensor learn status Ignition voltage Ignition voltage Engine Torque Inaccurate Engine actual torque Transmission output speed Throttle position Clutch pedal displacement If four wheel drive low AND Transmission gear ratio Transmission gear ratio If four wheel drive low AND Transmission gear ratio Transmission gear ratio The above conditions are met for DTC's not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts = False ≥ 50.00 Nm ≥ 120.00 rpm ≥ 8.00 Pct ≤ 10.00 Pct = TRUE ≥ 5.00 ratio < 5.50 ratio = FALSE ≥ 0.95 ratio < 1.05 ratio ≥ 1.50 seconds TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 5 incorrect ratio	P0735	Detects when the N/V gear ratio indicates 5th gear but the Gear Position Sensor does not indicate 5th gear	Gear Position Sensor	≠ Gear 5	Gear Position Sensor learn status Ignition voltage Ignition voltage Engine Torque Inaccurate Engine actual torque Transmission output speed Throttle position Clutch pedal displacement If four wheel drive low AND Transmission gear ratio Transmission gear ratio If four wheel drive low AND Transmission gear ratio Transmission gear ratio The above conditions are met for DTC's not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts = False ≥ 50.00 Nm ≥ 120.00 rpm ≥ 8.00 Pct ≤ 10.00 Pct = TRUE ≥ 5.00 ratio < 5.50 ratio = FALSE ≥ 0.77 ratio < 0.85 ratio ≥ 1.50 seconds TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear 7 incorrect ratio	P076F	Detects when the N/V gear ratio indicates 7th gear but the Gear Position Sensor does not indicate 7th gear	Gear Position Sensor	≠ Gear 7	Gear Position Sensor learn status Ignition voltage Ignition voltage Engine Torque Inaccurate Engine actual torque Transmission output speed Throttle position Clutch pedal displacement If four wheel drive low AND Transmission gear ratio Transmission gear ratio If four wheel drive low AND Transmission gear ratio Transmission gear ratio The above conditions are met for DTC's not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts = False ≥ 50.00 Nm ≥ 120.00 rpm ≥ 8.00 Pct ≤ 10.00 Pct = TRUE ≥ 5.00 ratio < 5.50 ratio = FALSE ≥ 0.43 ratio < 0.48 ratio ≥ 1.50 seconds TransmissionOutputRotationalStatusValidity EngineTorqueEstInaccurate ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6	≥ 1.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 1.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P18C7 P18C8 P2771		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Skip Shift Solenoid Control Circuit Open (Manual Transmission Only)	P0803	Diagnoses the skip shift solenoid control low side driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: ≥ 200 K Ω impedance between signal and controller ground	Run/Crank Voltage Engine Speed	Voltage ≥ 9 volts > 600 RPM	29 failures out of 200 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P080C may also set (Skip Shift Solenoid Circuit Short to Ground).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch Pedal Position Sensor Circuit Range / Performance	P0806	A Clutch Pedal position sensor range fault is detected, if Clutch Pedal Position Sensor is in a range indicative of a vehicle NOT in gear, when the vehicle is determined to be in gear. Gear determination is made by verifying that the ratio of engine RPM versus Transmission Output Speed (N/TOS) represents a valid gear. When this occurs a clutch pedal position error is measured and processed by a 1st order lag filter. When this clutch pedal position error exceeds the defined threshold, a this fault code is set.	Filtered Clutch Pedal Position Error when the vehicle is determined to be in gear	>4 %	N/TOS Ratio:	Must match actual gear (i.e. vehicle in gear)	25 ms loop Continuous	Type A, 1 Trips
					Transfer Case:	Not in 4WD Low range		
					Vehicle speed:	> 5.6 MPH		
					Engine Torque:	> **P0806 EngTorqueThreshold Table** (see Supporting Tables)		
					Clutch Pedal Position:	< **P0806 ResidualErrEnableLow Table** (see Supporting Tables)		
					OR	> **P0806 ResidualErrEnableHigh Table** (see Supporting Tables)		
					No Active DTCs:	ClutchPstnSnsrCktHi FA ClutchPstnSnsrCktLo FA CrankSensor_FA Transmission Output Shaft Angular Velocity Validity VehicleSpeedSensor_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch Pedal Position Sensor Circuit Low	P0807	A continuous circuit Out-of-Range Low or open fault is detected by monitoring the percent voltage range of the clutch pedal position signal. This sensor by design is dead banded at both the high and low positions. If the voltage from the sensor is below the defined threshold value for the dead banded region, a fail counter increments. When the correct ratio of fail counts to samples occurs the fault code is set.	Clutch Position Sensor Circuit	< 4 % of Vref	Engine Not Cranking System Voltage	 > 9.0 Volts	200 counts out of 250 samples 25 ms loop Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch Pedal Position Sensor Circuit High	P0808	A continuous circuit Out-of-Range High fault is detected by monitoring the percent voltage range of the clutch pedal position signal. This sensor by design is dead banded at both the high and low positions. If the voltage from the sensor is above the defined threshold value for the dead banded region, a fail counter increments. When the correct ratio of fail counts to samples occurs the fault code is set.	Clutch Position Sensor Circuit	> 96 % of Vref	Engine Not Cranking System Voltage	 > 9.0 Volts	200 counts out of 250 samples 25 ms loop Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch Pedal Position Not Learned	P080A	During final assembly at the manufacturing facility an initial Clutch Pedal Applied Learn is established. This Learn is used to understand the variation in the clutch fully applied position vs. the clutch pedal position. This position is then adjusted over time based on a learning algorithm in the engine controller to adjust for clutch physical wear with usage. This Diagnostic is used to detect when this Applied Learn value is outside of defined range based on the thresholds set by the diagnostic. If the Applied Learn value is outside of the range of the threshold values this fault code is set. The OBD Manufacturer's enable counter is utilized to prevent the MIL from setting during the vehicle assembly before a Position lean can be completed in the manufacturing facility.	Fully Applied Learn Position OR	< 9.0 % > 36.0 %	OBD Manufacturer's Enable Counter	= 0	250 ms loop Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Skip Shift Solenoid Control Circuit Low (Manual Transmission Only)	P080C	Diagnoses the skip shift solenoid control low side driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Run/Crank Voltage Engine Speed	Voltage ≥ 9 volts > 600 RPM	29 failures out of 200 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0803 may also set (Skip Shift Solenoid Circuit Open Circuit).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Skip Shift Solenoid Control Circuit High (Manual Transmission Only)	P080D	Diagnoses the skip shift solenoid control low side driver circuit for circuit faults	Voltage high during driver on state (indicates short to power)	Short to Power: ≤ 0.5 Ω impedance between signal and controller power	Run/Crank Voltage Engine Speed	Voltage ≥ 9 volts > 600 RPM	29 failures out of 200 samples 250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Inlet Airflow System Performance (supercharged)	P1101	Detects a performance failure in the Manifold Pressure (MAP) sensor, Supercharger Inlet Absolute Pressure (SCIAP) sensor, Throttle Position sensor (TPS) or Mass Air Flow (MAF) sensor that cannot be uniquely identified as a failure in one individual sensor. This diagnostic can set when more than one of these sensors has a performance concern. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from these four sensors. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a	See table **P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. TPS model fails when Filtered Throttle Model Error MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered SCIAP1 model fails when ABS(Measured SCIAP – SCIAP Model 1) Filtered SCIAP2 model fails when ABS(Measured SCIAP – SCIAP Model 2) Filtered	> 400 kPa*(g/s) > 30.0 grams/sec > 30.0 kPa > 30.0 kPa > 25.0 kPa > 25.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,200 RPM >= -7 Deg C = TRUE) <= 129 Deg C >= -20 Deg C <= 129 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		performance issue with the system, but no single failed sensor can uniquely be identified. In this case, the Inlet Airflow System Performance diagnostic will fail.			-	MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** SCIAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP1 Residual Weight Factor based on RPM** and **P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost** SCIAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P1101: SCIAP2 Residual Weight Factor based on RPM** and		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost		
					No Active DTCs:	MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA SCIAP_SensorCircuitFA AmbientAirDefault		
					No Pending DTCs:	EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP SCIAP_SensorCircuitFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 low side circuit shorted to high side circuit	P124E	Controller specific output driver circuit diagnoses injector 7 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 low side circuit shorted to high side circuit	P124F	Controller specific output driver circuit diagnoses injector 8 high sided driver for a short to low sided driver failure when the output is powered on by comparing a voltage measurement to controller specific voltage threshold	Voltage measurement outside of controller specific acceptable range during driver on state indicates high sided driver for a short to low sided driver failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for high sided driver for a short to low sided driver failure.	25 amp >= through low side driver	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ABS Rough Road malfunction	P1380	This diagnostic detects if the ABS controller is indicating a fault, and misfire is present. When this occurs, misfire will continue to run. If Misfire P0300 then sets while the ABS fault is present, P1380 will set as a diagnostic aid.	This DTC is used as a misfire diagnostic aid. If P0300 is set, and ECM has recieved indication that the rough road information from EBCM is faulted, the technition may take into account that the Misfire DTC may be due to rough road. The diagnnostic aid DTC will only set if secondary parameters are in a speed load condition where Misfire is susceptable to rough road. GMLan Message: "Wheel Sensor Rough Road Magnitude Validity"	= FALSE	Vehicle Speed Engine Speed Engine Load RunCrankActive Active DTC	VSS ≥ 5 mph rpm < 8,192 load < 100 % max indicated torque = TRUE P0300, MIL Request	40 failures out of 80 samples 250 ms /sample Continuous	Type C, No MIL "Special Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ABS System Rough Road Detection Communication Fault	P1381	This diagnostic detects if the rough road information is no longer being received from the ABS controller, and misfire is present. When this occurs, misfire will continue to run. If Misfire P0300 then sets while the communication fault is present, P1381 will set as a diagnostic aid.	This DTC is used as a misfire diagnostic aid. If P0300 is set, and ECM has lost the rough road information from EBCM, the technition may take into account that the Misfire DTC may be due to rough road. The diagnnostic aid DTC will only set if secondary parameters are in a speed load condition where Misfire is susceptable to rough road. Loss of GMLan Message: "Wheel Sensor Rough Road Magnitude"	 = TRUE	Vehicle Speed Engine Speed Engine Load RunCrankActive Active DTC	VSS ≥ 5 mph rpm < 8,192 load < 100 max indicated torque = TRUE P0300, MIL Request	40 failures out of 80 samples 250 ms /sample Continuous	Type C, No MIL "Special Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Circuit A Low	P18C4	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Controller specific Gear Position Sensor Circuit A Low diagnoses Gear Position Sensor Circuit A and wiring for an out of range low circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	Sensor type used If sensor type = Direct Proportional and Gear Position Sensor A duty cycle OR If sensor type = Indrect Proportional and Gear Position Sensor A duty cycle update fail and sample time when any OR condition occurs	CeSPMI_e_VoltageDirectProp ≤ 9.00 % ≥ 9.00 %	Ignition voltage Ignition voltage	≥ 9.00 volts ≤ 32.00 volts	≥ 3.00 seconds of fail time out of 5.00 seconds of sample time	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Circuit A High	P18C5	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Controller specific Gear Position Sensor Circuit A High diagnoses Gear Position Sensor Circuit A and wiring for an out of range high circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	Sensor type used If sensor type = Direct Proportional and Gear Position Sensor A duty cycle OR If sensor type = Indrect Proportional and Gear Position Sensor A duty cycle update fail and sample time when any OR condition occurs	CeSPMI_e_VoltageDirectProp ≥ 90.00 % ≤ 90.00 %	Ignition voltage Ignition voltage	≥ 9.00 volts ≤ 32.00 volts	≥ 3.00 seconds of fail time out of 5.00 seconds of sample time	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Circuit B Low	P18C6	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Controller specific Gear Position Sensor Circuit B Low diagnoses Gear Position Sensor Circuit AB and wiring for an out of range low circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	Sensor type used If sensor type = Direct Proportional and Gear Position Sensor B duty cycle OR If sensor type = Indrect Proportional and Gear Position Sensor B duty cycle update fail and sample time when any OR condition occurs	CeSPMI_e_VoltageDirectProp ≤ 9.00 % ≥ 9.00 %	Ignition voltage Ignition voltage	≥ 9.00 volts ≤ 32.00 volts	≥ 3.00 seconds of fail time out of 5.00 seconds of sample time	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Circuit B High	P18C7	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Controller specific Gear Position Sensor Circuit B High diagnoses Gear Position Sensor Circuit B and wiring for an out of range high circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	Sensor type used If sensor type = Direct Proportional and Gear Position Sensor B duty cycle OR If sensor type = Indrect Proportional and Gear Position Sensor B duty cycle update fail and sample time when any OR condition occurs	CeSPMI_e_VoltageDirectProp ≥ 90.00 % ≤ 90.00 %	Ignition voltage Ignition voltage	≥ 9.00 volts ≤ 32.00 volts	≥ 3.00 seconds of fail time out of 5.00 seconds of sample time	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Range/ Performance	P18C8	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Detects when the Gear Position Sensor A (X-axis) and B (Y-axis), values indicate a location between shifter gates that the shifter cannot physically (mechanically) achieve.	Gear position sensor X axis PWM % duty cycle Gear position sensor Y axis PWM % duty cycle Gear position sensor X axis PWM % duty cycle Gear position sensor Y axis PWM % duty cycle Gear position sensor X axis PWM % duty cycle	≥ **P18C8 Gear position sensor range/ performance (sensor A min area A)** AND ≤ **P18C8 Gear position sensor range/ performance (sensor A max area A)** AND ≤ 30.9998 PWM % duty cycle OR ≥ **P18C8 Gear position sensor range/ performance (sensor A min area B)** AND ≤ **P18C8 Gear position sensor range/ performance (sensor A max area B)** AND ≤ 30.9998 PWM % duty cycle OR ≥ **P18C8 Gear position sensor range/ performance (sensor A min area C)** AND ≤	diagnostic monitor enable calibration Gear Position Sensor learn status Ignition voltage Ignition voltage	= 0 Boolean = Learned ≥ 9.00 volts ≤ 32.00 volts	≥ 3.000 seconds Once the above fail time is achieved then increment the fail counter once ≥ 2 fail counts out of 2 sample counts	Type X, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				P18C8 Gear position sensor range/ performance (sensor A max area C) AND				
			Gear position sensor Y axis PWM % duty cycle	≤ 30.9998 PWM % duty cycle OR				
			Gear position sensor X axis PWM % duty cycle	≥ **P18C8 Gear position sensor range/ performance (sensor A min area D)** AND ≤ **P18C8 Gear position sensor range/ performance (sensor A max area D)** AND				
			Gear position sensor Y axis PWM % duty cycle	≤ 63.9999 PWM % duty cycle OR				
			Gear position sensor X axis PWM % duty cycle	≥ **P18C8 Gear position sensor range/ performance (sensor A min area E)** AND ≤ **P18C8 Gear position sensor range/ performance (sensor A max area E)** AND				
			Gear position sensor Y axis PWM % duty cycle	≤ 63.9999 PWM % duty cycle				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				OR				
			Gear position sensor X axis PWM % duty cycle	≥ **P18C8 Gear position sensor range/ performance (sensor A min area F)** AND ≤ **P18C8 Gear position sensor range/ performance (sensor A max area F)** AND				
			Gear position sensor Y axis PWM % duty cycle	≤ 63.9999 PWM % duty cycle				
			update fail time when any OR condition occurs	Refer to "Transmission Supporting Tables" for details				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Indicates Incorrect Gear Ratio	P18C9	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Detects when transmission is mechanically in neutral and Gear Position Sensor is not indicating a neutral position.	Gear Position Sensor, update fail time	= In Gear	Gear Position Sensor learn status Ignition voltage Ignition voltage Transmission output speed Clutch pedal displacement Engine speed DTCs not fault active	= Learned ≥ 9.00 volts ≤ 32.00 volts ≤ 10.00 rpm ≤ 10.00 pct ≥ 450.00 rpm TransmissionOutputRotationalStatusValidity ClutchPstnSnsr FA ClutchPstnSnsrNotLearned P18C4 P18C5 P18C6 P18C7 P18C8	≥ 3.00 seconds Once the above fail time is achieved then increment the fail counter once ≥ 2.00 fail counts	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Position Sensor Not Learned	P18CA	The gear position sensor is a single component containing an X-axis and a Y-axis sensor. The gear position sensor determines the manual transmission shift lever positon based on the PWM output of the X-axis and Y-axis sensors. Detects when the gear position sensor position not learned. Any offset due to hardware variation is captured when the gear position sensor X-axis and Y-axis PWM duty cycle offset is not learned during vehicle assembly or service, with the transmission shift lever in neutral position and the transmission mechanically in neutral.	Gear Position Sensor Learn status	= Not Learned	Manufacturer Enable Counter (MEC) Service learn timer The service learn timer will increment while a learn is in progress. If the learn is not completed in less than 120.00 seconds then the learn will abort	= 0 Counts = 0 seconds	Immediate Frequency 500ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 high side circuit shorted to ground	P217B	Controller specific output driver circuit diagnoses Injector 7 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 7 high side circuit shorted to power	P217C	Controller specific output driver circuit diagnoses Injector 7 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 high side circuit shorted to ground	P217E	Controller specific output driver circuit diagnoses Injector 8 high sided driver for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	25 amp >= through High Side Driver	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector 8 high side circuit shorted to power	P217F	Controller specific output driver circuit diagnoses Injector 7 high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 1 volt between signal and controller power	Battery Voltage Engine Run Time	>= 11 Volts >= 0 Seconds P062B not FA or TFTK	10 failures out of 20 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Performance (supercharged)	P2227	Detects a performance failure in the Barometric Pressure (BARO) sensor, such as when a BARO value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The BARO sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the BARO performance diagnostic will fail. If the BARO sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Supercharger Inlet Pressure (SCIAP) and BARO are compared to see if their values are similar. If the MAP and SCIAP sensor values are similar, but the BARO value is not similar, then a BARO performance diagnostic will fail. When the engine is	**Engine Running:** Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update OR Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update	> 15.0 kPa <= 0.06 miles > 20.0 kPa > 0.06 miles	No Active DTCs:	AmbPresSnsrCktFA IAT_SensorFA MAF_SensorFA AfterThrottlePressureFA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA	320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips
			Engine Not Rotating: Barometric Pressure OR Barometric Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Supercharger Inlet Pressure - Manifold Pressure) AND ABS(Supercharger Inlet Pressure - Baro Pressure)	< 50.0 kPa > 115.0 kPa > 10.0 kPa <= 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	> 8.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA SCIAP_SensorCircuitFA AAP2_SnsrCktFA MAP_SensorCircuitFP SCIAP_SensorCircuitFP AAP2_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		running, there is an estimate of barometric pressure that is determined with the Turbocharger Boost Pressure sensor, engine air flow and engine speed. If the BARO value from the sensor is not similar to this barometric pressure estimate, then the BARO performance diagnostic will fail.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #7 CIRCUIT Low	P2318	Diagnoses Cylinder #7 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #7 CIRCUIT High	P2319	Diagnoses Cylinder #7 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #8 CIRCUIT Low	P2321	Diagnoses Cylinder #8 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #8 CIRCUIT High	P2322	Diagnoses Cylinder #8 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Performance Traction Torque & Speed Request Circuit	P2548	Determines if torque and/or speed request from the EBTCM is valid	Protection error - Serial Communication message ($1C8) 2's complement not equal Torque Request Speed Request OR Rolling count error - Serial Communication message ($1C8) rolling count index value	 Message <> two's complement of message Message <> two's complement of message Message <> previous message rolling count value + one	Diagnostic Status Run/Crank Active Ignition Voltage No Serial communication loss to EBTCM (U0121)	Enabled > 0.50 seconds > 6.41 volts No loss of communication	Fail Threshold: >= 10 failures out of 20 samples Pass Threshold: >= 10 samples during key cycle. OR Fail Threshold >= 6 Rolling count errors out of 10 samples Performed on every received message	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Deactivation Solenoid Control Circuit/Open	P3401	Controller specific output driver circuit diagnoses the Cylinder 1 Deactivation Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3403 may also set (Cylinder 1 Deactivation Solenoid Control Circuit/ Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Deactivation Solenoid Control Circuit/Low	P3403	Controller specific output driver circuit diagnoses the Cylinder 1 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3401 may also set (Cylinder 1 Deactivation Solenoid Control Circuit/ Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Deactivation Solenoid Control Circuit/High	P3404	Controller specific output driver circuit diagnoses the Cylinder 1 Deactivation Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Deactivation Solenoid Control Circuit/Open	P3425	Controller specific output driver circuit diagnoses the Cylinder 4 Deactivation Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3427 may also set (Cylinder 4 Deactivation Solenoid Control Circuit/ Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Deactivation Solenoid Control Circuit/Low	P3427	Controller specific output driver circuit diagnoses the Cylinder 4 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Controller specific output driver circuit diagnoses the Cylinder 1 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3425 may also set (Cylinder 4 Deactivation Solenoid Control Circuit/ Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Deactivation Solenoid Control Circuit/High	P3428	Controller specific output driver circuit diagnoses the Cylinder 4 Deactivation Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.Diagnoses cylinder 4 deactivation solenoid control low side driver circuit for circuit faults	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 6 Deactivation Solenoid Control Circuit/Open	P3441	Controller specific output driver circuit diagnoses the Cylinder 6 Deactivation Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds	Voltage low during driver off state (indicates open circuit)Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3443 may also set (Cylinder 6 Deactivation Solenoid Control Circuit/ Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 6 Deactivation Solenoid Control Circuit/Low	P3443	Controller specific output driver circuit diagnoses the Cylinder 6 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3441 may also set (Cylinder 6 Deactivation Solenoid Control Circuit/ Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 6 Deactivation Solenoid Control Circuit/High	P3444	Controller specific output driver circuit diagnoses the Cylinder 6 Deactivation Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 7 Deactivation Solenoid Control Circuit/Open	P3449	Controller specific output driver circuit diagnoses the Cylinder 7 Deactivation Solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 k Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3451 may also set (Cylinder 7 Deactivation Solenoid Control Circuit/ Low)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 7 Deactivation Solenoid Control Circuit/Low	P3451	Controller specific output driver circuit diagnoses the Cylinder 7 Deactivation Solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage low during driver off state (indicates an short circuit to Ground) Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to Ground Circuit ≤ 0.5 Ω impedance between signal and controller ground	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips Note: In certain controllers P3449 may also set (Cylinder 7 Deactivation Solenoid Control Circuit/ Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 7 Deactivation Solenoid Control Circuit/High	P3452	Controller specific output driver circuit diagnoses the Cylinder 7 Deactivation Solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to Power ≤ 0.5 Ω impedance between signal and controller power	Diagnostic Status Powertrain Relay Voltage Engine RPM	Enabled ≥ 11.00 volts ≥ 400 rpm	>= 20 errors out of 25 samples Performed every 250 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve A Control Circuit	P0033	Controller specific output driver circuit diagnoses the 'compressor recirculation valve 'A' actuator' low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 200 K Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0034 may also set turbo/ super charger bypass valve control circuit low

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve A Control Circuit Low	P0034	Controller specific output driver circuit diagnoses the 'compressor recirculation valve 'A' actuator' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller ground	Diagnostic Enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0033 may also set turbo/ super charger bypass balve control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve A Control Circuit High	P0035	Controller specific output driver circuit diagnoses the 'compressor recirculation valve 'A' actuator' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller power.	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 2 Circuit Performance (applications with humidity sensor and manifold temperature sensor)	P0096	Detects an Intake Air Temperature 2 (IAT2) sensor value that is stuck in range by comparing the IAT2 sensor value against the IAT and IAT3 sensor values and failing the diagnostic if the IAT2 value is more different than the IAT and IAT3 values than is expected. If the engine has been off for a long enough period of time, the air temperature values in the engine compartment of the vehicle are considered to have equalized, and the diagnostic can be enabled. The diagnostic will fail if the IAT and IAT3 values are similar, and the IAT2 value is not similar to the IAT and IAT3 values. The diagnostic will also fail if none of the three sensor values are similar to each other, and the IAT2 value is furthest from the sensor value that is in the middle of the three sensor values. This diagnostic is executed once per	**<u>Good Correlation Between IAT and IAT3:</u>** ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT3)	> 30 deg C <= 25 deg C > 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	Type B, 2 Trips
			<u>Not Good Correlation, IAT in middle:</u> Power Up IAT is between Power Up IAT2 and Power Up IAT3 AND ABS(Power Up IAT2 - Power Up IAT3) AND ABS(Power Up IAT - Power Up IAT2) > ABS(Power Up IAT - Power Up IAT3)	> 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	
			<u>Not Good Correlation, IAT3 in middle:</u> Power Up IAT3 is between Power Up IAT and Power Up IAT2		Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds	Executes once at the beginning of each ignition cycle if enable conditions are met	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		ignition cycle if the enable conditions are met.	AND ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT3 - Power Up IAT2) > ABS(Power Up IAT3 - Power Up IAT)	> 30 deg C	No Active DTCs:	PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Pressure Measurement System - Multiple Sensor Correlation (single turbo)	P00C7	Detects an inconsistency between pressure sensors in the induction system in which a particular sensor cannot be identified as the failed sensor. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Manifold Pressure (MAP), Turbocharger Boost Pressure and Barometric Pressure (BARO) sensors values are checked to see if they are within the normal expected atmospheric pressure range. If they are, then MAP, Turbocharger Boost Pressure and BARO are compared to see if their values are similar. If two of these three sensors are similar, but the third is not, then a performance diagnostic for the specific sensor with the dissimilar value will fail. If there is no combination of two of	ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold	> 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating Manifold Pressure Manifold Pressure Baro Pressure Baro Pressure Turbocharger Boost Pressure Turbocharger Boost Pressure No Active DTCs: No Pending DTCs:	> 10.0 seconds >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa EngineModeNotRunTimerError MAP_SensorFA AAP_SnsrFA AAP2_SnsrFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		these three sensors that is similar, then the failed sensor cannot be uniquely identified. The Multiple Pressure Sensor Correlation Diagnostic will fail in this case.	Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	> 10.0 kPa > 10.0 kPa				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 3 Circuit Performance (applications with humidity sensor and manifold temperature sensor)	P00E9	Detects an Intake Air Temperature 3 (IAT3) sensor value that is stuck in range by comparing the IAT3 sensor value against the IAT and IAT2 sensor values and failing the diagnostic if the IAT3 value is more different than the IAT and IAT2 values than is expected. If the engine has been off for a long enough period of time, the air temperature values in the engine compartment of the vehicle are considered to have equalized, and the diagnostic can be enabled. The diagnostic will fail if the IAT and IAT2 values are similar, and the IAT3 value is not similar to the IAT and IAT2 values. The diagnostic will also fail if none of the three sensor values are similar to each other, and the IAT3 value is furthest from the sensor value that is in the middle of the three sensor values. This diagnostic is executed once per	**<u>Good Correlation Between IAT and IAT2:</u>** ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT3)	 <= 30 deg C > 25 deg C > 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	Type B, 2 Trips
			<u>Not Good Correlation, IAT in Middle:</u> Power Up IAT is between Power Up IAT2 and Power Up IAT3 AND ABS(Power Up IAT2 - Power Up IAT3) AND ABS(Power Up IAT - Power Up IAT3) > ABS(Power Up IAT - Power Up IAT2)	> 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	
			<u>Not Good Correlation, IAT2 in Middle:</u> Power Up IAT2 is between Power Up IAT and Power Up IAT3		Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds	Executes once at the beginning of each ignition cycle if enable conditions are met	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		ignition cycle if the enable conditions are met.	AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT3) > ABS(Power Up IAT2 - Power Up IAT)	> 25 deg C	No Active DTCs:	PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit 3 Low (applications with manifold temperature and humidity)	P00EA	Detects a continuous short to ground in the Intake Air Temperature 3 (IAT3) signal circuit by monitoring the IAT3 sensor output resistance and failing the diagnostic when the IAT3 resistance is too low. The IAT3 sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A lower resistance is equivalent to a higher temperature.	Raw IAT 3 Input	< 56.50 Ohms (~150 deg C)	Engine Run Time	> 0.00 seconds	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit 3 High (applications with manifold temperature and humidity)	P00EB	Detects a continuous open circuit in the Intake Air Temperature 3 (IAT3) signal circuit by monitoring the IAT3 sensor output resistance and failing the diagnostic when the IAT3 resistance is too high. The IAT3 sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A higher resistance is equivalent to a lower temperature.	Raw IAT 3 Input	> 162,529 Ohms (~-60 deg C)	Engine Run Time	> 0.00 seconds	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 3 Intermittent In-Range	P00EC	Detects a noisy or erratic signal in the Intake Air Temperature 3 (IAT3) circuit by monitoring the IAT3 sensor and failing the diagnostic when the IAT3 signal has a noisier output than is expected. When the value of the IAT3 signal in °C is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of IAT3 readings. The result of this summation is called a “string length”. Since the IAT3 signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic IAT3 signal. The diagnostic will fail if the string length is too high.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current IAT 3 reading - IAT 3 reading from 100 milliseconds previous)	> 80.00 deg C 10 consecutive IAT 3 readings	Continuous		4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow System Performance (single turbo)	P0101	Detects a performance failure in the Mass Air Flow (MAF) sensor, such as when a MAF value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAF sensor. In this case, the MAF Performance diagnostic	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND	> 20.0 grams/sec > 24.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 300 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		will fail.	Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow -	> 24.0 kPa > 24.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm/sec as a function of engine speed. See table	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm/sec as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Performance (single turbo)	P0106	Detects a performance failure in the Manifold Pressure (MAP) sensor, such as when a MAP value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The MAP sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the MAP performance diagnostic will fail. If the MAP sensor value is within the normal expected atmospheric range, then MAP, Turbocharger Boost Pressure, and Barometric Pressure (BARO) are compared to see if their values are similar. If the Turbocharger Boost Pressure and BARO sensor values are similar, but the MAP value is not similar, then a MAP performance diagnostic will fail.	**Engine Running:** See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE	> 20.0 grams/sec > 24.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 300 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAP sensor. In this case, the MAP Performance diagnostic will fail.	AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow -	> 24.0 kPa > 24.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm/sec as a function of engine speed See table	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				
			<u>Engine Not Rotating:</u> Manifold Pressure	 < 50.0 kPa	Time between current ignition cycle and the last time the engine was		4 failures out of 5 samples	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR Manifold Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	 > 115.0 kPa > 10.0 kPa > 10.0 kPa <= 10.0 kPa	running Engine is not rotating No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP	1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit Performance (applications with humidity sensor and manifold temperature sensor)	P0111	Detects an Intake Air Temperature (IAT) sensor value that is stuck in range by comparing the IAT sensor value against the IAT2 and IAT3 sensor values and failing the diagnostic if the IAT value is more different than the IAT2 and IAT3 values than is expected. If the engine has been off for a long enough period of time, the air temperature values in the engine compartment of the vehicle are considered to have equalized, and the diagnostic can be enabled. The diagnostic will fail if the IAT2 and IAT3 values are similar, and the IAT value is not similar to the IAT2 and IAT3 values. The diagnostic will also fail if none of the three sensor values are similar to each other, and the IAT value is furthest from the sensor value that is in the middle of the three sensor values. This diagnostic is executed once per	**<u>Good Correlation Between IAT2 and IAT3</u>** ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT3)	> 30 deg C > 25 deg C <= 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	Type B, 2 Trips
			<u>Not Good Correlation, IAT2 in Middle:</u> Power Up IAT2 is between Power Up IAT and Power Up IAT3 AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT) > ABS(Power Up IAT2 - Power Up IAT3)	> 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	
			<u>Not Good Correlation, IAT3 in Middle:</u> Power Up IAT3 is between Power Up IAT and Power Up IAT2		Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds	Executes once at the beginning of each ignition cycle if enable conditions are met	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		ignition cycle if the enable conditions are met.	AND ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT3 - Power Up IAT) > ABS(Power Up IAT3 - Power Up IAT2)	> 30 deg C	No Active DTCs:	PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Sensor Performance (single turbo)	P0121	Detects a performance failure in the Throttle Position sensor (TPS) sensor, such as when a TPS value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor and Mass Air Flow (MAF) sensor. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the TPS sensor. In this case, the TPS	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP -	> 20.0 grams/sec > 24.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 300 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Performance diagnostic will fail.	measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow AND	> 24.0 kPa > 24.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	> a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 1 Sensor 1 (For use with WRAF - E80	P0131	This DTC determines if the WRAF O2 sensor signal circuit is shorted low. This DTC will detect a short to ground fault to the Pump Current, Reference Cell Voltage and Reference Ground circuits. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B1S1 WRAF ASIC indicates a ground short to any of the following WRAF signals: A) Pump Current - short to ground fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to ground fail counts are accumulated to determine fault status. C) Reference Ground - short to ground fail counts are accumulated to determine fault status. Note: This ASIC is referred to as C2WRAF (Delphi). Note: A ground short on the Pump Current or Reference Voltage signal may also set a P223C DTC.	The ASIC provides a fault indication when the pump current pin is between -150 mV and +175 mV. The ASIC provides a fault indication when the Refernce Cell Voltage pin < 225 mV. The ASIC provides a fault indication when during the intrusive test the Reference Cell impedance change is ≤ 90 ohms. Note: Signal A & B faults must exist for 24 ASIC clock cycles to qualify for a fail flag. The three fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop WRAF Ref cell temperature ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True ≥ 628 Deg C = Complete ≥ 20.0 seconds	Signal A: 128 failures out of 160 samples OR Signal B: 128 failures out of 160 samples OR Signal C: 3 failures out of 1 samples Frequency for Signal A & B: Continuous in 25 milli - second loop Frequency for Signal C: Tested during an intrusive event performed every 60 seconds. During each event the impedance is measured 3 times once every 12.5 msec. Note: If the fail count value is greater than the sample count value that individual	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							monitor is disabled.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 1 Sensor 1 (For use with WRAF - E80	P0132	This DTC determines if the WRAF O2 sensor signal circuit is shorted high. This DTC will detect a short to power fault to the Pump Current (and Trim circuit), Reference Cell Voltage and Reference Ground circuit. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B1S1 WRAF ASIC indicates a short to power on any of the following WRAF signals: A) Pump Current - short to power fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to power fail counts are accumulated to determine fault status. C) Reference Ground - short to power fail counts are accumulated to determine fault status. <u>Note</u>: This ASIC is referred to as C2WRAF (Delphi).	The ASIC provides a fault indication when the pump current pin > 2.8 V. The ASIC provides a fault indication when the Reference Cell Voltage pin > 3.3 V. The ASIC provides a fault indication when the Reference Ground pin > 225 mV. <u>Note</u>: The above faults must exist for 21 ASIC clock cycles to qualify for a fail flag. The three fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid Status (ASIC) Controller status (ASIC) Engine Run or Auto stop WRAF Ref cell temperature ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True ≥ 628 Deg C = Complete ≥ 20.0 seconds	Signal A: 128 failures out of 160 samples OR Signal B: 128 failures out of 160 samples OR Signal C: 128 failures out of 160 samples Frequency: Continuous in 25 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Rich to Lean Bank 1 Sensor 1) (For use with WRAF	P015A	DTC P015A detects that the primary WRAF oxygen sensor for Bank 1 has delayed response when the air fuel ratio transitions from rich to lean condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor rich to lean tests (P013E / P013A / P2271), which commands fuel cut off. Note: The Primary method is used when the primary WRAF O2 sensor signal transitions from above to below the O2 measured EQR threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P015A diagnostic measures the primary WRAF O2 sensor response time between a rich condition above a starting measured EQR threshold and a lower measured EQR threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro,	Primary method: The EWMA of the Pre O2 sensor normalized R2L time delay value. The EWMA caluclation uses a 0.20 coefficient. OR Secondary Method: The Accumulated time monitored during the R2L Delayed Response Test. AND Pre WRAF O2 sensor measured EQR is	> 0.5 EWMA (sec) ≥ 4.0 Seconds > 0.900 EQR	No Active DTC's System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault Green O2S Condition	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0131, P0132, P013A, P013B, P013E, P013F, P2270, P2271 > 10.0 Volts = Not active = Not active = Not active = Not active = False = False = Not Valid, Green O2S condition is	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		and intake air temperature resulting in a normalized delay value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015A is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary WRAF O2 sensor does not achieve the required lower measured EQR			O2 Heater (pre sensor) on for Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral Closed Loop Active Evap	considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 40 seconds > 62 ºC = TRUE) > -40 ºC > 30 seconds 950 ≤ RPM ≤ 2,950 900 ≤ RPM ≤ 3,050 2.0 ≤ gps ≤ 12.5 40.4 ≤ MPH ≤ 77.7 35.4 ≤ MPH ≤ 82.0 0.80 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables). not in control of purge		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		threshold before a delay time threshold is reached.			Ethanol Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on Time Predicted Catalyst temp Fuel State =================== All of the above met for at least 2.0 seconds, and then the Force Cat Rich intrusive stage is requested. =================== Pre O2S EQR B1S1 at end of Cat Rich stage Fuel State Number of fueled cylinders =================== After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input).	not in estimate mode > 70 kpa = enabled = not active = not active ≥ 80.0 sec 550 ≤ ºC ≤ 950 = DFCO possible ================== ================== ≥ 1.080 EQR = DFCO active ≤ 3 cylinders ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 1) (For use with WRAF	P015B	DTC P015B detects that the primary WRAF oxygen sensor for Bank 1 has delayed response when the air fuel ratio transitions from lean to rich condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor lean to rich tests (P013F / P013B), which commands fuel enrichment. Note: The Primary method is used when the primary WRAF O2 sensor signal transitions from lean condition to above the O2 measured EQR threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P015B diagnostic measures the primary WRAF O2 sensor response time between a lean condition and a higher measured EQR threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in	Primary method: The EWMA of the Pre O2 sensor normalized L2R time delay value. The EWMA caluclation uses a 0.20 coefficient. OR Secondary method: The Accumulated time monitored during the L2R Delayed Response Test. AND Pre WRAF O2 sensor measured EQR is OR At end of Cat Rich stage the Pre WRAF O2 sensor measured EQR is	> 0.5 EWMA (sec) ≥ 4.4 Seconds < 1.000 EQR < 1.080 EQR	No Active DTC's P015A test is complete and System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0131, P0132, P013A, P013B, P013E, P013F, P015A, P2270, P2271 = Passed > 10.0 Volts = Not active = Not active = Not active = Not active = False = False	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		a normalized delay value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015B is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary WRAF O2 sensor does not achieve the required higher measured EQR threshold before a delay time threshold is			Green O2S Condition O2 Heater (pre sensor) on for Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral Closed Loop Active	= Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 40 seconds > 62 ºC = TRUE) > -40 ºC > 30 seconds 950 ≤ RPM ≤ 2,950 900 ≤ RPM ≤ 3,050 2.0 ≤ gps ≤ 12.5 40.4 ≤ MPH ≤ 77.7 35.4 ≤ MPH ≤ 82.0 0.80 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		reached.				**Loop Enable Clarification**" in Supporting Tables).		
					Evap Ethanol Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on time	not in control of purge not in estimate mode > 70 kpa = enabled = not active = not active ≥ 80.0 sec		
					Predicted Catalyst temp Fuel State Number of fueled cylinders	550 ≤ ºC ≤ 950 = DFCO inhibit ≥ 1 cylinders		
					================	==================		
					When above conditions are met: Fuel Enrich mode is entered.			
					================	==================		
					During this test: Engine Airflow must stay between: and the delta Engine Airflow over 12.5msec must be :	1 ≤ gps ≤ 12 ≤ 2.0 gps		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Engine Overboost Turbocharger with wastegate. Not supercharger with mechanical compressor	P0234	This DTC indicates an over boost failure. It's can be set in two paths. The boost negative deviation is detecting an overboost condition in pressure control closed loop and at constant driving condition. The over boost below basic pressure can detect an overboost condition when boost pressure control runs in open loop.	Desired boost pressure - Actual boost pressure	< refer to **P0234_KtBSTD_p_CntrlDevNegLim** - **P0234_P0299_KtBSTD_p_CntrlDevAmbAirCorr** in Supporting tables.	Dev. diagnostic enable **************************** Coolant temperature or OBD Coolant enable criteria and Coolant temperature Intake air temperature is in range Ambient air pressure is in range Engine speed in range Desired boost pressure in range Desired boost pressure derivative in range **************************** All conditions have to be fullfilled for: **************************** No active DTCs: **************************** Pressure control has to be in closed loop. No device control active for WG and compresseor	True **************************** > -40.0 °C = TRUE < 130.0 °C > -40.0 °C < 80.0 °C > 60.0 kPa < 120.0 kPa > 1,600 rpm < 6,000 rpm > 140.0 kPa < 300.0 kPa > -75.0 kPa/s < 75.0 kPa/s **************************** > refer to **P0234_P0299_KtBSTD_t_CntrlDevEnblDelay** in Supporting tables. **************************** BSTR_b_PCA_CktFA BSTR_b_TurboBypassCktFA ECT_Sensor_FA IAT_SensorFA BSTR_b_BoostSnsrFA AmbientAirDefault ****************************	14 failures out of 15 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					recirculation valve.			
			Actual boost pressure	> refer to **P0234_KtBSTD_p_CntrlDevBasLim** in Supporting tables. +Basic Pressure	Basic pressure diag enable and Dev. diagnostic enable **************************** Coolant temperature or OBD Coolant enable criteria and Coolant temperature Intake air temperature is in range Ambient air pressure is in range Engine speed in range All conditions haveto be fullfilled for: **************************** No active DTCs: **************************** Pressure control has to be in open loop. No device control active for WG and compresseor recirculation valve.	False True **************************** > -40.0 °C = TRUE < 130.0 °C > -40.0 °C < 80.0 °C > 60.0 kPa < 120.0 kPa > 2,000 rpm < 3,500 rpm > 2.00 Seconds **************************** BSTR_b_PCA_CktFA BSTR_b_TurboBypassCktFA ECT_Sensor_FA IAT_SensorFA BSTR_b_BoostSnsrFA AmbientAirDefault BSTR_b_PCA_TFTKO ****************************	100 failures out of 150 samples 100ms / sample	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Pressure (TIAP) Sensor Performance (single turbo)	P0236	Detects a performance failure in the Turbocharger Boost Pressure sensor, such as when a Turbocharger Boost Pressure value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Turbocharger Boost Pressure sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the Turbocharger Boost Pressure performance diagnostic will fail. If the Turbocharger Boost Pressure sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure and Barometric Pressure (BARO) are compared to see if their values are similar. If the MAP and BARO sensor values are similar, but the Turbocharger Boost Pressure value is not	<u>**Engine Running:**</u> See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP - TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP -	> 20.0 grams/sec > 24.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 300 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		similar, then a Turbocharger Boost Pressure performance diagnostic will fail. The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, Manifold Pressure (MAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the Turbocharger Boost Pressure sensor. In this case, the Turbocharger Boost Pressure Performance	measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow	> 24.0 kPa > 24.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		diagnostic will fail.	AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	> a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				
			Engine Not Rotating: Turbocharger Boost Pressure OR Turbocharger Boost	< 50.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating	> 10.0 seconds	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	> 115.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	- No Active DTCs: No Pending DTCs:	EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Pressure Sensor Circuit Low (Gen III)	P0237	Detects a continuous short to ground in the Turbocharger Boost Pressure signal circuit by monitoring the Turbocharger Boost Pressure sensor output voltage and failing the diagnostic when the Turbocharger Boost Pressure voltage is too low. The Turbocharger Boost Pressure sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	Turbocharger Boost Pressure Voltage	< 19.4 % of 5 Volt Range (This is equal to 0.97 Volts, or 49.9 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Pressure Sensor Circuit High (Gen III)	P0238	Detects a continuous short to power or open circuit in the Turbocharger Boost Pressure signal circuit by monitoring the Turbocharger Boost Pressure sensor output voltage and failing the diagnostic when the Turbocharger Boost Pressure voltage is too high. The Turbocharger Boost Pressure sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	Turbocharger Boost Pressure Voltage	> 78.0 % of 5 Volt Range (This is equal to 3.90 Volts, or 299.0 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid A Control Circuit	P0243	Controller specific output driver circuit diagnoses the 'turbocharger boost solenoid'A' actuator' low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0245 may also set turbocharger wastegate / supercharger boost solenoid A control circuit low

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid A Control Circuit Low	P0245	Controller specific output driver circuit diagnoses the 'turbocharger boost solenoid 'A' actuator' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A'is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0243 may also set turbocharger wastegate / supercharger boost solenoid A control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid A Control Circuit High	P0246	Controller specific output driver circuit diagnoses the 'turbocharger boost solenoid 'A' actuator' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A'is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller power	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Engine Underboost Turbocharger with wastegate. Not supercharger with mechanical compressor	P0299	This DTC indicates an under boost failure. It's can be set in two paths. The boost positive deviation is detecting an underboost condition in pressure control closed loop and constant driving condition. The Rate Limited underboost deviaion detects a too slow increasing boost pressure.	Desired boost pressure - Actual boost pressure	<refr to **P0299_KtBSTD_p_CntrlDevPosLim** + **P0234_P0299_KtBSTD_p_CntrlDevAmbAirCorr** in Supporting tables.	Dev. Diagnostic enable ***************************** Coolant temperature or OBD Coolant Enable Criteria and Coolant temperature Intake air temperature is in range Ambient air pressure is in range Engine speed in range Desired boost pressure in range Desired boost pressure derivative in range ***************************** All conditions haveto be fullfilled for: ***************************** No active DTCs: ***************************** Pressure control has to be in closed loop. No device control active for WG and compresseor	True ***************************** > -40.0 °C = TRUE) < 130.0 °C > -40.0 °C < 80.0 °C > 60.0 kPa < 120.0 kPa > 1,600 rpm < 6,000 rpm > 140.0 kPa < 300.0 kPa > -75.0 kPa/s < 75.0 kPa/s ***************************** >refer to **P0234_P0299_KtBSTD_t_CntrlDevEnblDelay** in Supporting tables. ***************************** BSTR_b_PCA_CktFA BSTR_b_TurboBypassCktFA ECT_Sensor_FA IAT_SensorFA BSTR_b_BoostSnsrFA AmbientAirDefault *****************************	14 failures out of 15 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					recirculation valve.			
			Actual boost pressure delta the delta is limited by these tables: refer to Max: **P0299_KtBSTD_p_CntrlDevDsrdRtHi** Min: **P0299_KtBSTD_p_CntrlDevDsrdRtLo** in Supporting tables.	< 10.00	Rate base diagostic enable and Dev. Diagnostic enable **************************** Coolant temperature or OBD Coolant enable criteria and Coolant temperature Intake air temperature is in range Ambient air pressure is in range Desired boost pressure in range Desired boost pressure derivative in hysteresis range Engine speed is in range **************************** All conditions have to be fullfilled for: **************************** No active DTCs: ****************************	False True **************************** > -40.0 °C = TRUE) < 130.0 °C > -40.0 °C < 80.0 °C > 60.0 kPa < 120.0 kPa > 140.0 kPa < 300.0 kPa Enable Limit: 20.0 Disable Limit: -20.0 > 2,000 rpm < 3,500 rpm **************************** > 0.20 Seconds **************************** BSTR_b_PCA_CktFA BSTR_b_TurboBypassCktFA ECT_Sensor_FA IAT_SensorFA BSTR_b_BoostSnsrFA AmbientAirDefault ****************************	10 failures out of 20 samples 100ms / sample	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Pressure control has to be in closed loop. No device control active for WG and compresseor recirculation valve.			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Active Grill Air Shutter A Performance /Stuck OFF	P059F	A 2-part diagnostic. Part 1 continuously monitors for failure to achieve a commanded shutter actuator position [Suspect Stuck Condtion] when X failures occur in Y samples after an electronic command latency delay. Part 1 failure enables Part 2 which makes a fixed number of repeat attempts to reach the commanded postion [ReTry to clear obstruction]. The DTC is set when the calibrated fault threshold count of repeat attempts is reached without achieving the original commanded shutter position.	Smart Shutter Actuator 1 Position Response AND Shutter 1 Diagnostic Delay Threshold count	<> Smart Shutter Actuator 1 Commanded Position percent AND Counter > 69.00 counts	a. Ignition Run_Crank Active, b. Ignition Run_Crank AND Ignition Accessory AND ECU Awake, c. Command Shutter1 Enable	a. = TRUE, b. = FALSE AND = FALSE AND = TRUE, c. = 1.00	1.00 failures out of 1.00 samples 1 sample / 100 milliseconds	Type B, 2 Trips
			Shutter 1 Performance Test count	= 5.00 counts	a. Ignition Run_Crank Active, b. Ignition Run_Crank AND Ignition Accessory AND ECU Awake, c. Command Shutter1 Enable	a. = TRUE, b. = FALSE AND = FALSE AND = TRUE, c. = 1.00	1-5 actuator cycles [1 cycle typically requires 10-25 seconds]	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft System Cold Start Performance – Bank 1	P05CE	Detects a VVT system error during Cold Starts by comparing the desired and actual cam positions when VVT is activated. This is the same type diagnostic as P0014 except this detects excessive deviations of position while the cold start phaser positions are being commanded.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive	Cam Position Error > 6.00 deg.	**Exhaust Cam Phsr Enable**	= TRUE	65 failures out of 75 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Catalyst Warmup Enabled	= TRUE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> 6.00 deg AND < 32.00 deg		
					Desired cam position variation	< 3.00 deg for (**P0014_P05CE_StablePositionTimeEc1**) sec		
					No Active DTCs	P0013 P2090 P2091		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Relay Control Circuit Open	P0627	Controller specific output driver circuit diagnoses the Feed Fuel Pump Relay high sided driver for an open circuit failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground.	Run/Crank Voltage Engine Speed	Voltage 11.00 volts 0 RPM	8 failures out of 10 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0629 may also set (Fuel Pump Relay Control Short to Power)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Relay Control Circuit High Voltage	P0629	Controller specific output driver circuit diagnoses the Feed Fuel Pump Relay high sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 0.5 Ohms impedance between signal and controller power	Run/Crank Voltage Engine Speed	Voltage 11.00 volts 0 RPM	8 failures out of 10 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0627 may also set (Fuel Pump Relay Control Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module O2 Sensor Processor Performance Bank 1) (For use with WRAF	P064D	Diagnoses the WRAF Application-Specific Integrated Circuit (ASIC) for Controller Status and Measure Valid faults. These faults can impact closed loop fuel control. This DTC when enabled, monitors the two different failure counters it receives from the WRAF ASIC. The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the two individual fail and sample counters.	B1S1 WRAF ASIC indicates control module faults	Controller Status fail counts and Measure Valid fail counts are accumulated to determine fault status	Engine Run or Auto stop Heater Warm-up delay WRAF circuit diagnostic delay since power up	= True = Complete ≥ 20.0 sec	128 controller status fail counts out of 160 samples OR 128 measure valid fail counts out of 160 samples 25 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Control Module (FPCM) Requested MIL Illumination	P069E	Monitors the FPCM MIL request message to determine when the FPCM has detected a MIL illuminating fault.	Fuel Pump Control Module Emissions-Related DTC set and module is requesting MIL	Fuel Pump Control Module Emissions-Related DTC set and module is requesting MIL		Time since power-up ≥ 3 seconds	Continuous	Type A, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference #5 Circuit	P06D2	Detects a continuous or intermittent short on the 5 volt reference circuit #5 by monitoring the reference voltage and failing the diagnostic when the voltage is too low or too high or if the delta between the filtered voltage and non-filtered voltage is too large. This diagnostic only runs when battery voltage is high enough.	ECM Vref5 < or ECM Vref5 > or the difference between ECM filtered Vref5 and Vref5 >	4.875 5.125 0.0495	Diagnostic enabled AND [(Run/Crank voltage for Time period AND Starter engaged) OR (Run/Crank voltage AND Starter engaged)]	= 1 > 6.41 volts = 0.02 seconds = FALSE > 8.41 volts = TRUE	19 / 39 counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Two Stage Oil Pump Control Circuit Performance - Two Sided	P06DD	Diagnoses the two stage oil pump is stuck in the high pressure state. This diagnostic includes an intrusive test and a passive test. Intrusive test: The oil pump control is cycled off (high pressure) and on (low pressure) Y times at calibratable intervals. If a change in oil pressure above a calibration is not detected then the oil pressure is checked to determine if it is stuck. It takes X-out-of-Y failures to fail and set the appropriate code. Passive test: After the intrusive test passes, then a passive test will begin to run. The passive test will monitor the oil pressure changes associated with oil pump control state changes. If the passive test determines that the oil pressure change was less then desired then the intrusive test is retriggered.	Fail from passing state:		Common Criteria:		≥ 12 errors out of 15 samples.	Type B, 2 Trips
			Oil Pressure delta is less than a minimum delta pressure on a state change and the measured filtered oil pressure is above a threshold	Oil Pressure delta = ABS [Filtered Oil Pressure at beginning of state change - filtered oil pressure after 1.5 seconds]	Two Stage Oil Pump is Present	TRUE		
					Engine Running	≥ 20.0 seconds		
					Ambient Air Pressure	≥ 70.0 kPa	Run once per trip or activiated by the Passive Test	
				Oil Pressure delta < **P06DD_P06DE_OP_StateChangeMin**	Oil Aeration (= TRUE if engine speed > 5,000 RPM for longer than 30.0 seconds)	FALSE		
				AND	No active DTC's for diagnsotic enable:	Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA OilPmpTFTKO		
				Filtered Oil Pressure ≥ (**P0521_P06DD_P06DE_OP_HiStatePressure** + **P06DD_P06DE_OP_LoStatePressure**) ÷ 2	Check oil pump TFTKO as a diagnostic enable when Enabled.	Enabled : OilPmpTFTKO		
				(see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_StateChangeMin** **P0521_P06DD_P06DE_OP_HiStatePressure** **P06DD_P06DE_OP_LoStatePressure**)	No active DTC's for control enable:	Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA		
					Active Criteria: One Sided Performance Test = Disabled	Disabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Oil Pump in Low State Modelled Oil Temperature within range Filtered Engine Speed within range Delta Filtered Engine Speed within a range Engine Torque within range Filtered Oil Pressure within range	> 1.5 seconds 70.0 deg C ≤ Oil Temp ≤ 115.0 deg C 1,100 RPM ≤ Filtered Engine Speed ≤ 2,500 RPM ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 150 RPM **P06DD_P06DE_MinEnableTorque_OP** ≤ Indicated Requested Engine Torque ≤ **P06DD_P06DE_MaxEnableTorque_OP** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinEnableTorque_OP** **P06DD_P06DE_MaxEnableTorque_OP**) Filtered Engine Oil Pressure > **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinOilPressThresh**)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Expected Oil Pressure Delta within range	96.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 200.0 kPa		
					<u>Passive Criteria:</u>			
					Active Test Passed	TRUE		
					Filtered Engine Speed within range	1,500 RPM ≤ Filtered Engine Speed ≤ 4,000 RPM		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 120.0 deg C		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.50 seconds] ≤ 450 RPM		
					Oil Pressure Delta within a range	Oil Pressure Delta < **P06DD_P06DE_OP_StateChangeMin** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_StateChangeMin**)		
			<u>Fast Pass Condition</u> Oil Pressure delta is less than a minimum delta pressure on a state change and the measured filtered oil pressure is	Oil Pressure delta = ABS [Filtered Oil Pressure at beginning of state change -	<u>Common Criteria:</u> Two Stage Oil Pump is Present Engine Running	 TRUE ≥ 20.0 seconds	0 errors out of 5 samples. Run once per trip or activiated by the Passive Test	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			above a threshold	filtered oil pressure after 1.5 seconds] Oil Pressure delta < **P06DD_P06DE_OP_StateChangeMin** AND Filtered Oil Pressure ≥ (**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**) ÷ 2 (see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_StateChangeMin** **P0521_P06DD_P06DE_OP_HiStatePressure** **P06DD_P06DE_OP_LoStatePressure**)	Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 5,000 RPM for longer than 30.0 seconds) No active DTC's for diagnsotic enable: Check oil pump TFTKO as a diagnostic enable when Enabled. No active DTC's for control enable: Active Criteria: One Sided Performance Test = Disabled Oil Pump in Low State Modelled Oil Temperature within range Filtered Engine Speed within range	≥ 70.0 kPa FALSE Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA OilPmpTFTKO CrankSensor_FA Enabled : OilPmpTFTKO Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA Disabled > 1.5 seconds 70.0 deg C ≤ Oil Temp ≤ 115.0 deg C 1,100 RPM ≤ Filtered Engine Speed ≤ 2,500		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						RPM		
					Engine Torque within range	**P06DD_P06DE_MinEnableTorque_OP** ≤ Indicated Requested Engine Torque ≤ **P06DD_P06DE_MaxEnableTorque_OP** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinEnableTorque_OP** **P06DD_P06DE_MaxEnableTorque_OP**)		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 150 RPM		
					Filtered Oil Pressure within range	Filtered Engine Oil Pressure > **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_MinOilPressThresh**)		
					Expected Oil Pressure Delta within range	96.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 200.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Temperature Sensor Circuit High	P105B	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P105B diagnoses the ESC temperature sensor for out of range high circuit faults. The diagnostic failure counter is incremented if the ESC temperature information is below the threshold value. This DTC is set based on the fail and sample counters.	Stop-Start capacitor temperature value	< -60.0 ºC	No active DTCs Diagnostic reporting is enabled when the following two steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec	10 failure out of 14 samples 500ms cycle time continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Temperature Sensor Circuit Low	P105C	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P105C diagnoses the ESC temperature sensor for out of range low circuit faults. The diagnostic failure counter is incremented if the ESC temperature information is above the threshold value. This DTC is set based on the fail and sample counters.	Stop-Start capacitor temperature value	> 180.0 ºC	No active DTCs Diagnostic reporting is enabled when the following two steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec	10 failure out of 14 samples 500ms cycle time Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Temperature Sensor Not Plausible	P105D	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P105D diagnoses the ESC temperature sensor for rationality faults by comparing it to other temperature sensors after a soak time (to allow all sensors to reach ambient condition). The diagnostic fails if the absolute ESC temperature difference when compared to the other temperature sensors is above the threshold value.	Absolute value of temperature difference between capacitor and DCDC converter AND Absolute value of temperature difference between capacitor and capacitor switch (K2)	> 15.0 ºC > 15.0 ºC	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) ECM off time Then, (B) LIN bus wake up Then, (C) ESCM wake up delay Note: This is not a continuous diagnositc. It runs once at LIN bus wake up, after ECM off time is large enough.	U135C, U1347, P1066 > 28,800 sec = TRUE > 0.50 sec	Wake up test only. Fault is set at first detection.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DCDC Converter Temperature Sensor Circuit High	P105E	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P105E diagnoses the DCDC Converter (inside the ESCM) temperature sensor for out of range high circuit faults. The diagnostic failure counter is incremented if the DCDC temperature information is below the threshold value. This DTC is set based on the fail and sample counters.	DCDC converter temperature	< -50.0 ºC	No active DTCs Diagnostic reporting is enabled when the following two steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec	10 failure out of 14 samples 500ms cycle time continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DC/ DC Converter Temperature Sensor Circuit Low	P105F	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P105F diagnoses the DCDC Converter (inside the ESCM) temperature sensor for out of range low circuit faults. The diagnostic failure counter is incremented if the DCDC temperature information is above the threshold value. This DTC is set based on the fail and sample counters.	DCDC converter temperature	> 160.0 ºC	No active DTCs Diagnostic reporting is enabled when the following two steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec	10 failure out of 14 samples 500ms cycle time continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DC/ DC Converter Temperature Sensor Not Plausible	P1060	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1060 diagnoses the DCDC Converter (inside the ESCM) temperature sensor for rationality faults by comparing it to other temperature sensors after a soak time (to allow all sensors to reach ambient condition). The diagnostic fails if the absolute DCDC Converter temperature difference when compared to the other temperature sensors is above the threshold value.	The absolute value of temperature difference between DCDC converter and capacitor. AND The absolute value of temperature difference between DCDC converter and capacitor switch (K2).	> 15.0 ºC > 15.0 ºC	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) ECM off time Then, (B) LIN bus wake up Then, (C) ESCM wake up delay Note: This is not a continuous diagnositc. It runs once at LIN bus wake up, after ECM off time is large enough.	U135C, U1347, P1066 > 28,800 sec = TRUE > 0.50 sec	Wake up test only. Fault is set at first detection.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Secondary Switch Temperature Sensor Circuit High	P1061	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1061 diagnoses the Secondary Switch (K2) (inside the ESCM) temperature sensor for out of range high circuit faults. The diagnostic failure counter is incremented if the Secondary Switch temperature information is below the threshold value. This DTC is set based on the fail and sample counters.	Capacitor switch (K2) temperature	< -50.0 ºC	No active DTCs Diagnostic reporting is enabled when the following two steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec	10 failure out of 14 samples 500ms cycle time continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Secondary Switch Temperature Sensor Circuit Low	P1062	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1062 diagnoses the Secondary Switch (K2) (inside the ESCM) temperature sensor for out of range low circuit faults. The diagnostic failure counter is incremented if the Secondary Switch temperature information is above the threshold value. This DTC is set based on the fail and sample counters.	The capacitor switch (K2) temperature	> 160.0 ºC	No active DTCs Diagnostic reporting is enabled when the following two steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec	10 failure counts out of 14 samples 500ms cycle time continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Secondary Switch Temperature Sensor Not Plausible	P1063	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1063 diagnoses the Secondary Switch (K2) (inside the ESCM) temperature sensor for rationality faults by comparing it to other temperature sensors after a soak time (to allow all sensors to reach ambient condition). The diagnostic fails if the absolute Secondary Switch (K2) temperature difference when compared to the other temperature sensors is above the threshold value.	The absolute value of temperature difference between the capacitor switch (K2) and the capacitor. AND The absolute value of tempeature difference between the capacitor switch (K2) and DCDC converter.	> 15.0 ºC > 15.0 ºC	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) ECM off time Then, (B) LIN bus wake up Then, (C) ESCM wake up delay Note: This is not a continuous diagnositc. It runs once at LIN bus wake up, after ECM off time is large enough.	U135C, U1347, P1066 > 28,800 sec = TRUE > 0.50 sec	Wake up test only. Fault is set at first detection.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Voltage Low During Start Assist	P1064	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1064 diagnoses the assist system by monitoring the system voltage during an auto start event. Note: in some cases it averages over multiple auto start events for improved robustness. The diagnostic fails if the calibrated diagnostic method does not satisfy the corresponding threshold value.	The diagnostic method is selected from method (A) or (B) below. The two methods are: Method (A) = CeUCCD_e_UseGrd OR Method (B) = CeUCCD_e_UseDeltaVlt The method used on this application is ********************* Method (A) - The average system voltage during an assisted auto start is Method (B) - The average system voltage delta during an assisted auto start is	= CeUCCD_e_UseDeltaVlt ********************* ≤ 9.00 V > 1.50 V	No active DTCs Low Fuel Condition Diag Fuel Level Data Fault ECT (Or OBD Coolant Enable Criteria Auto start is commanded from an auto stop state	U135C, U1347, P1066, UCAP_RmdlActFltFA UCAP_TempOOR_FA UCAP_TempRatFA ECT_Sensor_Ckt_FA ECT_Sensor_Perf_FA = FALSE = FALSE > 30.0 ºC = TRUE) = TRUE	Diagnostic runs when auto start is commaned from an auto stop state. Minimum auto stop time > 1.00 sec The test result average is calculated using data from 3 auto start events.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Charging Current Performance	P1065	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1065 diagnoses the ESS charging system by monitoring the capacitor voltage while the engine is running and comparing it to the expected voltage target value. The diagnostic failure counter is incremented if the ESC voltage is below the threshold value based on the temperature derating level. This DTC is set based on the fail and sample counters.	The diagnostic measures the capacitor voltage and compares it to a calibration value that is specific to the temperature derating level . ***************************** Derating level 0 Capacitor temperature Capacitor voltage threshold to arm the auto start ***************************** Derating level 1 Capacitor temperature Capacitor voltage threshold ***************************** Derating level 2 Capacitor temperature Capacitor voltage threshold *****************************	************************* -40.0 ºC < capacitor temperature < 55.0 ºC ≤ Refer to **P1065_UCAP_Arm_Autostart_Thresh_Derating_Zero** in the Supporting Tables tab. ************************* 55.0 ºC ≤ capacitor temperature < 61.0 ºC ≤ 2.70 V ************************* 61.0 ºC ≤ capacitor temperature < 73.0 ºC ≤ 2.20 V *************************	No active DTCs ECT (Or OBD Coolant Enable Criteria Engine run No change of the capacitor derating level during the test Capacitor temperature Delay period before accumulating fails (allows time for caps to charge)	U135C, U1347, P1066, UCAP_RmdlActFltFA UCAP_TempOOR_FA UCAP_TempRatFA ECT_Sensor_Ckt_FA ECT_Sensor_Perf_FA > 30.0 ºC = TRUE) = TRUE = TRUE -40.0 ºC < capacitor temperature < 73.0 ºC = 20.0 seconds	320 failures out of 400 samples 500ms cycle time Continuously runs when enable conditions are met.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Status Message Counter Incorrect	P1066	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. The ESCM communicates with the ECM using a LIN network. P1066 diagnoses the LIN system by monitoring the Active Rolling Counter (ARC) value. The diagnostic failure counters are incremented when the individual LIN frame ARC error flags are set. This DTC is set based on the fail and sample counters.	If one or more of the following Alive Rolling Counter (ARC) errors in LIN frames from the capacitor control module has matured, P1066 is set: ARC error counts for UCAP Current Status frame OR ARC error counts for UCAP Temperature Status frame OR ARC error counts for UCAP Temperature Fault frame OR ARC error counts for UCAP Part Number frame	= 10 failures ouf of 10 samples = 10 failures out of 10 samples = 10 failures out of 10 samles = 10 failures out of 10 samples	Diagnostic reporting is enabled when the following conditions are met: (A) LIN bus wake up Then, (B) Diagnostic delay (C) Powertrain Relay Voltage (D) Run/Crank Ignition Voltage	= TRUE ≥ 3.00 sec ≥ 11.00 V ≥ 11.00 V	Executes in 12.5 ms loop Continuously	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Performance	P1067	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1067 diagnoses the ESCM performance by monitoring five specific fault cases. P1067 Indicates one or more of the following faults have occured: Case 1: The ground switch (K1) current sensor is faulty. Case 2: The capacitor switch (K2) current sensor is faulty. Case 3: The onboard voltages indicate a faulty voltage regulator. Case 4: The analog input circuits are faulty. Case 5: The capacitor voltage sensor is stuck at maximum. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Case 1: The ground switch (K1) current is out of range	< -1330 amps OR > 1330 amps	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.51 sec	Test cycle time is 5ms Error count increases by 10 if an error is detected, up to a maximum value of 200. Error count decreases by 1 if no error is detected, minimum value 0. Fault is set when error count = 200 (100ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips
			Case 2: The ground switch (K2) current is out of range	< -1330 amps OR > 1330 amps	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then,	U135C, U1347, P1066 = TRUE	Test cycle time is 5ms Error count increases by 10 if an error is detected, up to a maximum value of 200. Error count	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					(B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	> 0.50 sec > 0.51 sec	decreases by 1 if no error is detected, minimum value 0. Fault is set when error count = 200 (100ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	
			Case 3: Internal Power Supplies 2.5 V Reference 5.0 V Linear regulator 15.0 V Boost regulator are not functional or out of range.	Correct range is: 2.5 V +/- 0.1% 5.0 V +/- 0.2 V 15.0 V +/- 1.0 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; ; or whenever fault state from ESCM changes its value	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.51 sec	Test cycle time is 5ms Error count increases by 100 if an error is detected, up to a maximum value of 200. Error count decreases by 1 if no error is detected, minimum value 0. Fault is set when error count = 200 (10 ms fault maturity) Fault is removed	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Afterwards, this diagnostic runs continuously.		when error count = 0. (1 sec healing time)	
			Case 4: The analog input circuits are faulty: Measured 2.5V Reference voltage of out of range, which is a indicator that the analog inputs to A/D converter are faulty	< 2.23 V OR > 2.78 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Internal Power Supplies DCDC	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.51 sec = OK = Not active	Test cycle time is 5ms Error count increases by 20 if an error is detected, up to a maximum value of 200. Error count decreases by 1 if no error is detected, minimum value 0. Fault is set when error count = 200 (50ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	
			Case 5: The measured capacitor voltage	≥ 5.86 V	No active DTCs Diagnostic reporting is enabled when the following three steps	U135C, U1347, P1066	Test cycle time is 10ms Error count increases by 10 if an error is	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	= TRUE > 0.50 sec > 0.51 sec	detected, up to a maximum value of 100. Error count decreases by 1 if no error is detected, minimum value 0. Fault is set when error count = 100 (100ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Deteriorated	P1068	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1068 diagnoses the ESC deteriation (end of life) by monitoring three specific fault cases. This DTC is set any of the three criteria met their respective thresholds.	Capacitance OR Equivalent serial resistance (ESR) OR Number of consecutive cycles in which one of the capacitor cells has a voltage 0.6V lower than the other.	< 480 Farads > 3.6 milliion Ohms = 10 times	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Note: This is not continuous diagnostic.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.10 sec	The capacitance and ESR are calculated during state of health determination. Fault is set after first detection. Cell voltage difference is calculated after ESCM wake up. Fault is set after 10 consecutive detections. This is a persistent fault that can only be removed by service.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Voltage High	P1069	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1069 diagnoses the ESC voltage for out of range high faults. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	capacitor voltage	> 5.8 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.51 sec	Test cycle time 10ms Error count increases by 2 if an error is detected, up to a maximum value of 100. Error count decreases by 1 if no error is detected, minimum value 0. Fault is set when error count = 100 (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Battery Negative Circuit Driver "A" and "B" Stuck Open	P106A	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P106A indicates that the ground switch (K1) is in a high impedance state. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Voltage drop across the ground switch (K1) when current > 550 amps OR Voltage drop across the ground switch (K1) when current > 550 amps OR Voltage drop across the ground switch (K1) when current ≤ 550 amps OR Voltage drop across the ground switch (K1) when current ≤ 550 amps	< -0.8 V > 0.8 V < -0.4 V > 0.4 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the folloiwng conditions are met: Capacitor switch (K2) open Ground switch (K1) close is commanded	U135C, U1347, P1066 = TRUE > 0.50 sec > 1.01 sec = TRUE = TRUE	Test cycle time is 10ms. Error count increases by 1 if an error is detected, up to a maximum of 100. Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 100. (1 sec fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Ground Switches "A" or "B" Stuck Open	P106B	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P106B indicates that both banks of ground switch (K1) stuck open, cannot be closed. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	The ground switch (K1) flip-flop state. Note: flip-flop is a basic hardware component used by software to command the switch to open or close. K1 driver voltage bank A K1 driver voltage bank B	= stuck open < 10.46 V < 10.46 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Ground switch is commanded to close	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.05 sec = TRUE	Test cycle time is 5ms. Error count increases by 20 if an error is detected, up to a maximum of 200. Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 200. (50ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Control Module Capacitor Output Circuit Driver Stuck Open	P106C	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P106C indicates that both ground switch (K1) and capacitor switch (K2) are in a high impedance state The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Ground switch (K1) in high impedance, P106A Capacitor switch (K2) is high impedance ****************************** OR ****************************** Ground switch (K1) in high impedance, P106A Capacitor switch (K2) flip-flop Note: The Flip-flop is a hardware component used by software to command the switch to open or close	= Active = TRUE = Active = Stuck open	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.10 sec	Test cycle time is 100ms. Error count increases by 10 if an error is detected, up to a maximum of 10. (Fault is set after first detection.) Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 10. (100ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type X, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Charge Pump Performance	P106D	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P106D indicates that the charge pump (internal safety supply voltage) does not work correctly. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	The Internal safety supply voltage	< 11.23 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met, once per drive cyle: Capacitor voltage Authorization to support start	U135C, U1347, P1066 = TRUE > 0.50 sec > 1.10 sec ≥ 4.7 V = FALSE	Tested once per driving cycle. Needs enabling from SW: enable - wait 500ms - diagnose during 500 ms - disable. Test cycle time 10 ms. Error count increases by 10 if an error detection occurs up to a maximum of 100. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 100. (100ms fault maturity) Fault can only be removed in the next wake up, or by LIN message.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module State of Health Unkown	P106E	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P106E indicates that the ESCM has determined the ESC state of health as unknown. The DTC is set when enabled and the ESC state of health is not determined.	ESC state of health	= not determined.	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Note: This diagnostic runs once per trip.	U135C, U1347, P1066 = TRUE > 0.50 sec > 10.00 sec	Once per trip.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Self Test Incomplete	P106F	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P106F indicates that the ESCM self test has not been performed / completed for multiple consecutive trip cycles. The self test is performed during powerdown after trip completion. The DTC is set when the not performed / completed trip cycle counter is greater than the threshold.	Consecutive trip cycles in which the self-test has not been performed / completed	> 10 drive cycles	No active DTCs	U135C, U1347, P1066	Wake up test only. Fault is set after first detection. Fault can be healed if the self test is performed / completed without errors in the last trip cycle.	Type B, 2 Trips
					Diagnostic reporting is enabled when the following three steps finish:			
					(A) LIN bus wake up	= TRUE		
					Then,			
					(B) ESCM wake up delay	> 0.50 sec		
					Then,			
					(C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value	> 0.03 sec		
					Note: This diagnostic runs at wake up using information from previous power down.			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Output Circuit	P1070	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1070 indicates that the ESC voltage output line is disconnected or the DCDC converter is defective. The DTC is set when: 1) The malfunction criteria mets the threshold value (Case 1 & 3) or, 2) The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value (Case 2).	Case 1: The capacitor voltage increase rate after 5s of charge	< 20 mV / s	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Note: This diagnostic runs at every charge when the following conditions are met: DCDC charging Capacitor voltage	U135C, U1347, P1066 = TRUE > 0.50 sec > 5.00 sec = Active > 0.5 V	First 5 seconds of each charge. Fault is set after first detetion. Once Fault is set, it will persist in the same driving cycle, and inhibit use of DCDC. Fault will be removed in the next wake up or by LIN message.	Type A, 1 Trips
			Case 2: Capacitor output voltage Capacitor (dual cell) mid point voltage	< 0.5 V > 0.8 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up	U135C, U1347, P1066 = TRUE	Test cycle time is 5ms. Error count increases by 10 if an error detection occurs up to a maximum	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	 > 0.50 sec > 5.00 sec	of 100. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 100. (50ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	
			Case 3: The difference between the following items (A) and (B) (A) the sum of 3 Capacitor voltage samples (sampled with a 10ms reccurence after DCDC starts charging) (B) the Capacitor voltage sampled before starting the charge multiplied by 3	> 2.7 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM	U135C, U1347, P1066 = TRUE > 0.50 sec > 5.00 sec	First 30ms every time DCDC charging is active. Fault is set after first detetion. Once Fault is set, it will persist in the same driving cycle, and inhibit use of DCDC. Fault will be removed in the next wake up or by LIN message	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					changes its value Note: This diagnostic runs at every charge, when the following conditions met: DCDC charging	 = Active		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Read Only Memory Performance	P1071	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1071 indicates a failure of the ESCM ROM (flash program memory). The DTC is set when enabled and the ESCM ROM memory checksum does not match.	The calculated checksum across the ROM memory doesn't match the stored checksum computed during the build of the software.	checksum does not match.	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.01 sec	10ms cycle time to scan a portion of ROM. The whole memory is scanned in less than 2.6 seconds. If fault is detected, perform a reset up to a predefined number of times (5 times). if this number has expired go to a Fail Safe State that can only be left by ECU powerdown Note: in Fail Safe State, LIN communication is on, K1 is closed, DCDC is off. Fault can only be removed in next wake up or by LIN message.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Random Access Memory Performance	P1072	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1072 indicates a failure of the ESCM RAM. The DTC is set when enabled and the ESCM RAM memory cell is stuck high or low.	An error is detected while testing the RAM.	RAM memory cell is stuck at high or low	No active DTCs	U135C, U1347, P1066	10ms cycle time to scan a portion of RAM. The whole memory is scanned in less than 2.6 seconds. Fault is detected when one of the cells is not functioning correctly. If fault is detected, perform a reset up to a predefined number of times (5 times). If this number has expired go to a Fail Safe State that can only be left by ECU Powerdown Note: in Fail Safe State, LIN communication is on, K1 is closed, DCDC is off. Fault can only removed in next wake up or by	Type B, 2 Trips
					Diagnostic reporting is enabled when the following three steps finish:			
					(A) LIN bus wake up	= TRUE		
					Then,			
					(B) ESCM wake up delay	> 0.50 sec		
					Then,			
					(C) Fault maturity delay expires, and the next valid LIN frame has been received. or whenever fault state from ESCM changes its value	> 0.01 sec		
					Afterwards, this diagnostic runs continuously.			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							LIN message.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Long Term Memory Performance	P1073	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1073 indicates a failure of the ESCM EPROM. The DTC is set when enabled and the ESCM EPROM memory checksum does not match the stored value.	CRC checksum calculation of the non volatile memory blocks	The calculated CRC doesn't match the stored CRC	No active DTCs	U135C, U1347, P1066	EEPROM is scanned at control module wake up. Fault is set at first detection. Fault can only be removed in next wake up, or by LIN message.	Type B, 2 Trips
					Diagnostic reporting is enabled when the following three steps finish:			
					(A) LIN bus wake up	= TRUE		
					Then,			
					(B) ESCM wake up delay	> 0.50 sec		
					Then,			
					(C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value	> 0.10 sec		
					Note: diagnostic runs at control module wake up.			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Long Term Memory Reset	P1074	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1074 indicates a failure of the ESCM long term mermory. The DTC is set when enabled and the ESCM reset counter mets / exceeds the threshold value.	unexpected reset counter	≥ 15 counts	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Note: diagnostic runs at capacitor control module wake up.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.10 sec	Capacitor control module wake up test only. Each unexpected reset increments the Unexpected Resets counter by 3 up to a maximum of 15. Each expected reset decrements the conter by 1 up to a minimum of 0. Fault is set when the counter reaches 15. Fault can only by removed in next wake up, or by LIN message.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Start-Stop Capacitor Sense Circuit Low	P1075	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1075 indicates that the ESC middle point voltage sense line is in an open circuit / short to GND faulted state or that the ESC is defective. The DTC is set when the malfunction criteria mets the threshold value for Case 1 or Case 2.	Case 1: Voltage increase rate of the capacitor after 5 seconds of charge	< 10 mV / s	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: DCDC charging Charging current	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.03 sec = active > 40 Amps	Detection is done in the first 5 seconds at each charge. Fault is set at first detection. Fault can only be removed at next wake up, or by LIN message.	Type A, 1 Trips
			Case 2: The capacitor (dual cell) mid point voltage before starting balance The capacitor (dual cell) mid point voltage after starting balance.	< 0.1 V > 0.8 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up	U135C, U1347, P1066 = TRUE	Detect after each balance of capacitor cells. Fault is set at first detection. Once set, this fault will inhibit	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Note: balance is used to make the capacitor voltage equally distributed between the two cells.		Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Then, this diagnostic runs after each balance.	 > 0.50 sec > 0.03 sec	further cells balancing. Fault can only be removed in the next wake up or by LIN message.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Start-Stop Capacitor Sense Circuit High	P1076	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1076 indicates that the ESC middle point voltage sense line has a short to power fault. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Capacitor mid point line voltage	> 4.8 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec > 2.10 sec	Test cycle time is 100ms. Error count increases by 1 if an error is detected, up to a maximum of 20. Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 20. (2 sec fault maturity) Fault is removed when error count = 0. (2 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module LIN System Voltage Low	P1077	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1077 indicates that the LIN supply voltage is too low. The LIN supply voltage input is monitored and compared to the threshold value. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	LIN supply voltage	< 9.12 V	No active DTCs Diagnostic reporting is enabled when the following steps (A)~(D) finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Engine run time Then, (D) Fault maturity delay time expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions met: Ground switch (K1) Capactor switch (K2) Engine run time after each auto stop event	U135C, U1347, P1066 = TRUE > 0.50 sec > 3.0 sec > 5.00 sec = Closed = Open > 3.0 sec	Test cycle time is 10ms. Error count increases by 2 if an error is detected, up to a maximum of 100. Error count decreases by 1 if no error is detected up to a minimum of 0. Fault is set when error count = 100. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module LIN System Voltage High	P1078	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1078 indicates that the LIN supply voltage is too high. The LIN supply voltage input is monitored and compared to the threshold value. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	LIN supply voltage	> 17.16 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Ground switch (K1) Capactor switch (K2)	U135C, U1347, P1066 = TRUE > 0.50 sec > 5.00 sec = Closed = Open	Test cycle time is 10ms. Error count increases by 2 if an error is detected up to a maximum of 100. Error count decreases by 1 if no error is detected up to a minimum of 0. Fault is set when error count = 100. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module LIN System Voltage Performance	P1079	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1079 indicates that the difference between the received reference voltage and the measured LIN supply votlage is too high. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	The absolute value of difference of the following two items (A) and (B): (A) measured LIN supply voltage (B) received engine run crank voltage from LIN message	> 2.5 V	No active DTCs Diagnostic reporting is enabled when the following steps (A)~(D) finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Engine Mode Run Then, (D) Fault maturity delay time expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Ground switch (K1) Capactor switch (K2) Engine run time after each auto stop event	U135C, U1347, P1066 = TRUE > 0.50 sec > 3.0 sec > 5.00 sec = Closed = Open > 3.0 sec	Test cycle time is 100ms. Error count increases by 2 if an error is detected, up to a maximum of 10. Error count decreases by 1 if no error is detected up to a minimum of 0. Fault is set when error count = 10. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DC/ DC Converter System Voltage Low	P107A	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P107A indicates that the measured battery (input to the DC/DC Converter system) is too low. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Measured battery voltage	< 6.34 V	No active DTCs Diagnostic reporting is enabled when the following steps (A)~(D) finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Engine run time Then, (D) Fault maturity delay time expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously when the following conditions are met: Measured LIN supply voltage Engine run time after each auto stop event	U135C, U1347, P1066 = TRUE > 0.50 sec > 3.0 sec > 0.11 sec > 6.5V + 380 mv hysteresis > 3.0 sec	Test cycle time is 10ms. Error count increases by 10 if an error is detected, up to a maximum of 100. Error count decreases by 1 if no error is detected up to a minimum of 0. Fault is set when error count = 100. (100ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DC/ DC Converter System Voltage High	P107B	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P107B indicates that the measured battery (input to the DC/DC Converter system) is too high. The measured battery (input to the DC/DC Converter system) input is monitored and compared to the threshold value. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Measured battery voltage	> 17.06 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously when the following conditions are met: Measured LIN supply voltage	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.11 sec > 6.5 V + 380 mv hysteresis	Test cycle time is 10ms. Error count increases by 10 if an error detection occurs up to a maximum of 100. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 100. (100ms fault maturity) Fault is removed when error count = 0. (1 sec healing time).	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DC/ DC Converter Supply Voltage Circuit Performance	P107C	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P107C indicates that the difference between the received reference voltage and the measured battery (input to the DC/DC Converter system) voltage is too high. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	The absolute value of difference between the following two items (A) and (B): (A) Mesured battery voltage (B) Received engine run crank voltage	> 2.5 V	No active DTCs Diagnostic reporting is enabled when the following steps (A)~(D) finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Engine run time Then, (D) Fault maturity delay time expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Ground swith (K1) Capacitor switch (K2) Engine run time after each auto stop event	U135C, U1347, P1066 = TRUE > 0.50 sec > 3.0 sec > 5.00 sec = Closed = Open > 3.0 sec	Test cycle time is 100ms. Error count increases by 2 if an error is detected up to a maximum of 10. Error count decreases by 1 if no error is detected up to a minimum of 0. Fault is set when error count = 10. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Control Module Backup System Voltage Low	P107D	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P107D indicates that the measured external safe supply (input to the ESCM) voltage is too low. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Measured external safe supply voltage	< 62 % of the measured battery voltage	No active DTCs Diagnostic reporting is enabled when the following steps (A)~(D) finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Engine run time Then, (D) Fault maturity delay time expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously when the following conditions are met: Measured LIN supply voltage Engine run time after each auto stop event	U135C, U1347, P1066 = TRUE > 0.50 sec > 3.0 sec > 0.60 sec > 6.5 V + 380 mv hysteresis > 3.0 sec	Test cycle time is 100ms. Error count increases by 2 if an error is detected, up to a maximum of 10. Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 10. (500ms fault maturity) Fault is removed when error count = 0. (1sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Control Module Backup System Voltage High	P107E	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P107E indicates that the measured external safe supply (input to the ESCM) voltage is too high. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Measured external safe supply voltage	> 17.16 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Aftterwards, this diagnostic runs when the following conditions are met: Ground switch (K1) Capacitor switch (K2)	U135C, U1347, P1066 = TRUE > 0.50 sec > 5.00 sec = Closed = Open	Test cycle time is 100ms. Error count increases by 2 if an error is detected, up to a maximum of 10. Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 10. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Control Module Backup System Voltage Performance	P107F	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P107F indicates that the difference between the received reference voltage and the measured external safe supply (input to the ESCM) voltage is too high. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Absolute value of difference of the following two items (A) and (B): (A) measured extrnal safe supply voltage (B) received engine run crank voltage	> 2.5 V	No active DTCs	U135C, U1347, P1066	Test cycle time is 100ms. Error count increases by 2 if an error is detected, up to a maximum of 10. Error count decreases by 1 if no error is detected, up to a minimum of 0. Fault is set when error count = 10. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips
					Diagnostic reporting is enabled when the following steps (A)~(D) finish:			
					(A) LIN bus wake up	= TRUE		
					Then, (B) ESCM wake up delay	> 0.50 sec		
					Then, (C) Engine run time	> 3.0 sec		
					Then, (D) Fault maturity delay time expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value	> 5.00 sec		
					Afterwards, this diagnostic runs when the following conditions are met:			
					Ground switch (K1)	= Closed		
					Capacitor switch (K2)	= Open		
					Engine run time after each auto stop event	> 3.0 sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Battery Negative Circuit Driver "A" Low	P1080	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1080 indicates that the ground switch (K1) bank A driver is stuck at open when should be closed. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Gound switch (K1) bank A gate voltage is low. Note: the gate voltage is to assure that the switch stays closed when commanded.	< 10.5V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Measured LIN supply voltage Ground switch (K1) is commanded to close according to flip-flop output	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.50 sec > 6.5 V + 380 mv hysteresis = TRUE	Test cycle time is 5ms. Error count increases by 2 if an error detection occurs up to a maximum of 200. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 200. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Battery Negative Circuit Driver "A" High	P1081	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1081 indicates that the ground switch (K1) bank A driver is stuck at closed when should be open. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value	Ground switch (K1) bank A gate voltage	> 2.0 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Ground switch (K1) is commaned to open according to flip-flop output And, Measured LIN supply voltage	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.05 sec = TRUE > 6.5 V + 380 mv hysteresis	Test cycle time is 5ms. Error count increases by 29 if an error detection occurs up to a maximum of 203. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 203. (50ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Battery Negative Circuit Driver "A"-"B" Not Plausible	P108A	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P108A indicates that the difference between the ESCM ground switch (K1) bank A gate voltage and bank B gate voltage is too high. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	The absolute value of difference between the following two items (A) and (B) (A) K1A gate voltage (B) K1B gate voltage	> 2.0 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously	U135C, U1347, P1066 = TRUE > 0.50 sec > 5.00 sec	Test cycle time is 100ms. Error count increases by 2 if an error detection occurs up to a maximum of 10. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 10. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Battery Negative Circuit Driver "B" Low	P108B	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P108B indicates that the ground switch (K1) bank B driver is stuck at open when should be closed. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Gound switch (K1) bank B gate voltage	< 10.5 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received. Afterwards, this diagnostic runs when the following conditions are met: Measured LIN supply voltage Ground switch (K1) is commanded to close according to flip-flop output	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.50 sec > 6.5 V + 380mv hysteresis = TRUE	Test cycle time is 5ms. Error count increases by 2 if an error detection occurs up to a maximum of 200. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 200. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Battery Negative Circuit Driver "B" High	P108C	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P108C indicates that the ground switch (K1) bank B is stuck at closed when should be open. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Ground switch (K1) bank B gate voltage	> 2.0 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received. Afterwards, this diagnostic runs when the following conditions are met: Ground switch (K1) is commanded to close according to flip-flop output And, Measured LIN supply voltage	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.05 sec = TRUE > 6.5 V + 380 mv hysteresis	Test cycle time is 5ms. Error count increases by 29 if an error detection occurs up to a maximum of 203. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 203. (50ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module DC/ DC Converter Discharging Performance	P108D	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P108D indicates that one or more of the following two ESCM DC/DC Converter discharging faults have occurred: Case 1) DCDC does not stop charging when requested; Case 2) DCDC is unable to discharge the capacitor The DTC is set when: 1) The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the	Case 1: DCDC does not stop charging when requsted Charging current	> 10 Amps	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: DCDC disabled OR DCDC discharging	U135C, U1347, P1066 = TRUE > 0.50 sec > 15.00 sec = TRUE = TRUE	Test cycle time is 10ms. Error count increases by 1 if an error detection occurs up to a maximum of 200. Error count decreases by 2 if no error detection occurs up to a minimum of 0. Fault is set when error count = 200. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		error count maximum value (Case 1) or, 2) The malfunction criteria mets the threshold value (Case 2)	Case 2: DCDC is unable to discharge the capacitor: Capacitor voltage decrease rate	< 6 mv / second in first 15 sec discharging time	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: DCDC discharging Capacitor voltage	U135C, U1347, P1066 = TRUE > 0.50 sec > 15.00 sec = TRUE > 0.5 V	Detect during first 15 seconds ot discharging. Fault is set after first detection. Fault can only be removed in the next wake up, or by LIN message.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capcitor Control Module DC/ DC Converter Charging Performance	P108E	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P108E indicates that one or more of the following two ESCM DC/DC Converter Charging faults have occurred: Case 1) Charge current is too high Case 2) DCDC does not charge when requested The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Case 1: Charge current is too high Phase 1 charge current OR Phase 2 charge current	 > 36.75 Amps > 68.25 Amps	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: DCDC charging	U135C, U1347, P1066 = TRUE > 0.50 sec > 2.10 sec = TRUE	Test cycle time is 10 ms. Error count increases by 10 if an error detection occurs up to a maximum of 100. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 100. (100 ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips
			Case 2: DCDC does not charge when requested: ****************************** Condition (I) if DCDC is charging with half current OR capacitor voltage > 4V ***************************** Charge current	 < 15 Amps	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay	U135C, U1347, P1066 = TRUE > 0.50 sec	Detection starts after 500 ms charge. Test cycle time is 10 ms. Error count increases by 1 if an error detection occurs up to a maximum of 200.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			****************************** Condtion (II) if DCDC is charging with full current AND capacitor voltage ≤ 4 V ******************************		Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received.	> 2.10 sec	Error count decreases by 1 if no error detection occurs up to a minimum of 0.	
			Charge current	< 30 Amps	Note: After intial time delay, diagnostic runs if the following conditions satisfy:		Fault is set when error count = 200.	
					DCDC charging	= TRUE	Fault is removed when error count = 0.	
					DCDC charging time	≥ 500 ms		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Self Test Failed	P108F	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P108F indicates that one ore more of the following three faults have occurred: Case 1) Unable to switch over to capacitor switch (K2) during self test, Case 2) An unintended switchover to capacitor switch (K2) during self test, Case 3) Capacitor switch (K2) is in a high impedance state or diode mode during self test The DTC is set when the malfunction criteria mets the threshold values in any of the three cases.	Case 1: Unable to switch over to capacitor switch (K2) during self test if either (A) or (B) is TRUE: (A) Hardware current comparator output stuck at passive. And, the measured battery voltage Note: hardware current comparator is used to automatically provoke a switch if the current flowing through the ground switch (K2) is greater than a threshold. (B) Hardware voltage comparator is stuck at passive. And, the measured battery voltage Note: hardware voltage comparator is used to automatically provoke a switch if the battery voltage is less than a threshold.	< 13.3 V ≥ 13.3 V	No active DTCs Diagnostic reporting is enabled when the following steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value And, (D) Fault is deteced following previous drive cycle during powerdown self test. Note: This is not continuous diagnostic.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.10 sec	Detect during part two of the self test procedure only if there was no switch (K1-K2-K1) in the drving cycle. Self test procedure is performed at the end of the drive cycle after ESCM is not in working state, i.e. no LIN commnication, and further delay by 120 seconds. Fault is set after first detection. Fault can only be removed in the following driving cycle when self test runs again.	Type A, 1 Trips
			Case 2: Unintended switchover to capacitor switch (K2) during self test if either (A) or (B) is TRUE: (A) Hardware current comparator output is		No active DTCs Diagnostic reporting is enabled when the following steps finish: (A) LIN bus wake up	U135C, U1347, P1066	Detect during part one of the self test procedure. Self test procedure is performed at the	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			always triggerred. And, the measured battery voltage Note: hardware current comparator is used to automatically provoke a switch if the current flowing through the ground switch (K2) is greater than a threshold. (B) Hardware voltage comparator output is always triggerred. And, the measured battery voltage Note: hardware voltage comparator is used to automatically provoke a switch if the battery voltage is less than a threshold (9.5V)	< 3.3 V OR > 7.5 V ≥ 3.3 V AND ≤ 7.5 V	Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value And, (D) Fault is deteced following previous drive cycle during powerdown self test. Note: This is not continuous diagnostic.	= TRUE > 0.50 sec > 0.10 sec	end of the drive cycle after ESCM is not in working state, i.e. no LIN commnication, and further delay by 120 seconds. Fault can only be removed in the following driving cycle when self test runs again.	
			Case 3: Capacitor switch (K2) is in a high impedance state or diode mode during self test; Measured battery voltage jumps immediately after the switch, i.e. ground switch (K1) changes from close to open, meanwhile capacitor switch (K2) changes from open to close.	< 1.0 V	No active DTCs Diagnostic reporting is enabled when the following steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.10 sec	Detect during part two of the self test procedure. Self test procedure is performed at the end of the drive cycle after ESCM is not in working state, i.e. no LIN commnication,	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Note: this test requires that measured capacitor voltage	> 2.0 V	expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value And, (D) Fault is deteced following previous drive cycle during powerdown self test.		and further delay by 120 seconds. Fault can only be removed in the following driving cycle when self test runs again.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Internal Circuitry Performance	P1090	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1090 indicates a ESCM power interconnection defect on control board / power board. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the counter reaches the error count maximum value.	Measured 2.5V reference voltage	< 2.18 V OR > 2.83 V	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Internal power supply DCDC charging OR discharging	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.51 sec = OK = TRUE	Test cycle time is 10ms. Error count increases by 2 if an error detection occurs up to a maximum of 100. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 100. (500ms fault maturity) Fault is removed when error count = 0. (1 sec healing time)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Stop-Start Capacitor Control Module Switch Deteriorated	P1091	The Energy Storage Capacitor (ESC) and Energy Storage Control Module (ESCM) are used on certain 12 volt start stop applications to improve the vehicle system voltage during engine start events. P1091 diagnoses the ESCM switch degridation by monitoring four specific fault cases. P1091 Indicates one or more of the following faults have occured: Case 1) Ground switch (K1) is in short circuit when it should be open Case 2) Capacitor switch (K2) is in a high impedance or in diode mode when it should be closed. Case 3) Capacitor switch (K2) close command does not close K2 when required. Case 4) Capacitor control module has reached its end of life. The diagnostic failure counters are incremented and decremented based on error detection, the DTC is set when the	Case 1: Ground switch (K1) current measurement AND Capcitor switch current measurement	< -120 Amps > 60 Amps	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value. Afterwards, this diagnostic runs when the following conditions are met: Capacitor switch (K2) closed	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.03 sec = TRUE	Test cycle time is 1ms. Error count increases by 10 if an error detection occurs up to a maximum of 100. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 100. (10ms fault maturity) Fault is removed when error count = 0. (100ms healing time)	Type A, 1 Trips
			Case 2: Measured ground switch (K1) current AND Measured capacitor switch (K2) current	> 40A < 30A	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay	U135C, U1347, P1066 = TRUE > 0.50 sec	Test cycle time is 1ms. Error count increases by 10 if an error detection occurs up to a maximum of 100. Error count decreases by 1 if no error	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		counter reaches the error count maximum value.			Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met: Capacitor switch (K2)	> 0.03 sec = Closed	detection occurs up to a minimum of 0. Fault is set when error count = 100. (10 ms fault maturity) Fault is removed when error count = 0. (100ms healing time)	
			Case 3: Capacitor switch (K2) stuck at open when it should be closed	n.a.	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) Diagnostic delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs when the following conditions are met:	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.03 sec	Test cycle time is 10ms. Error count increases by 34 if an error detection occurs up to a maximum of 102. Error count decreases by 1 if no error detection occurs up to a minimum of 0. Fault is set when error count = 102. (30ms fault maturity) Fault is removed when error count	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Capacitor switch (K2) is commanded to close, according to flip-flop output	= TRUE	= 0. (1.2 sec healing time)	
			Case 4: Number of switchbacks between ground switch (K1) and capacitor switch (K2)	> 2 million times	No active DTCs Diagnostic reporting is enabled when the following three steps finish: (A) LIN bus wake up Then, (B) ESCM wake up delay Then, (C) Fault maturity delay expires, and the next valid LIN frame has been received; or whenever fault state from ESCM changes its value Afterwards, this diagnostic runs continuously.	U135C, U1347, P1066 = TRUE > 0.50 sec > 0.03 sec	Detect after every switch-back. Fault is set after first detection. This fault is permament, can only be removed by service tool.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Inlet Airflow System Performance (single turbo)	P1101	Detects a performance failure in the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor, Throttle Position sensor (TPS) or Mass Air Flow (MAF) sensor that cannot be uniquely identified as a failure in one individual sensor. This diagnostic can set when more than one of these sensors has a performance concern. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from these four sensors. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP -	> 20.0 grams/sec > 24.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 300 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the system, but no single failed sensor can uniquely be identified. In this case, the Inlet Airflow System Performance diagnostic will fail.	measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow	> 24.0 kPa > 24.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	> a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auto Start Stop Select Switch Signal Circuit Include ONLY for start stop conventional hybrid applications	P15A3	For start stop conventional hybrid applications, this diagnoses the auto start stop select signal circuit (BCM to ECM Rolling Count check).	Rolling count value received from BCM does not match expected value	= TRUE	Engine Speed Engine Speed Engine speed between min/max for Vehicle Speed for Hybrid type	≥ 200 RPM ≤ 7,500 RPM ≥ 5.0 seconds ≤ 318.14 MPH ≥ 5.0 seconds =CeINFR_e_StartStopConv	> 3 error counts for > 10.0 seconds 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit Open	P171A	Controller specific transmission surge accumulator control circuit diagnoses the transmission surge accumulator and wiring for an open circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission surge accumulator control circuit impedance	≥ 200 K Ω impedance between signal and controller ground			fail time ≥ 0.188 seconds out of sample time ≥ 0.250 seconds	Type B, 2 Trips
					battery voltage AND battery voltage	≥ 11.00 volts ≤ 32.00 volts		
					update battery enable time		battery enable time ≥ 5.00 seconds	
					run/crank voltage	≥ 5.00 volts	25 milliseconds	
					diagnostic monitor enable	= 1 Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit Low	P171B	Controller specific transmission surge accumulator control circuit diagnoses the transmission surge accumulator and wiring for a ground short circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission surge accumulator control circuit impedance	≤ 0.5 Ω impedance between signal and controller ground	battery voltage AND battery voltage update battery enable time run/crank voltage diagnostic monitor enable	≥ 11.00 volts ≤ 32.00 volts ≥ 5.00 volts = 1 Boolean	fail time ≥ 0.188 seconds out of ≥ 0.250 seconds battery enable time ≥ 5.00 seconds 25 milliseconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit High	P171C	Controller specific transmission surge accumulator control circuit diagnoses the transmission surge accumulator and wiring for a short to power circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission surge accumulator control circuit impedance	≤ 0.5 Ω impedance between signal and controller voltage source			fail time ≥ 0.069 seconds out of sample time ≥ 0.081 seconds	Type B, 2 Trips
					battery voltage AND battery voltage	≥ 11.00 volts ≤ 32.00 volts		
					update battery enable time		battery enable time ≥ 5.00 seconds	
					run/crank voltage	≥ 5.00 volts	25 milliseconds	
					diagnostic monitor enable	= 1 Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Accumulator System Performance	P171D	Detects when the surge accumulator system, used to provide transmission hydraulic pressure, is not capable of supplying adequate hydraulic pressure during an engine auto-start. The transmission holding clutch pressures are commanded to meet the engine crank shaft torque output, to prevent clutch slip to those holding clutches, during the engine auto-start. The diagnostic monitors transmission input shaft speed during the auto-start event as the primary malfunction criteria. Measured input shaft speed that is excessive is an indication the holding clutches are slipping due to inadequate hydraulic pressure, as a result of a failed surge accumulator system.	Transmission turbine speed is greater than predicted turbine speed during autostart event, update initial fail count	≥ **P171D predicted turbine speed error** Refer to "Transmission Supporting Tables" for details	PRNDL state defaulted Transmission shift lever position Propulsion system active Ignition voltage Ignition voltage Transmission fluid temp Transmission fluid temp Hybrid state AutoStop duration min During autostop Engine speed was **************************** If above conditions are met then the following must occur: Turbine speed Engine speed Hydraulic pressure delay time If above conditions are met then increment time-out timer. Time-out timer Note: The initial fail	= False = Forward range A = True > 9.00 volts < 31.99 volts > 0.00 °C < 110.00 °C = Engine off ≥ 1.200 seconds < 5.0 RPM ≥ 80.0 RPM ≥ 450.0 RPM ≥ **P171D hydraulic pressure delay** Refer to "Transmission Supporting Tables" for details ≤ 0.38 seconds	≥ 12 counts (initial fail count) Frequency =12.5ms Once the above counts are achieved then increment the final fail counter once. The final fail counter can only increment once per autostart event ≥ 3 counts (final fail counter) If above counter is greater than threshold then report DTC failed. Frequency = 12.5ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					counter must achieve it's fail threshold in less than the time-out time.			
					*****************************			
					If vehicle is launched then:			
					Transmission gear ratio	= 4.5600 1st gear ratio = 2.9700 2nd gear ratio = 2.0700 3rd gear ratio = 1.6800 4th gear ratio = 1.2700 5th gear ratio = 1.0000 6th gear ratio		
					Trans 1st gear ratio high	≤ 1.120 times 1st gear ratio		
					Trans 1st gear ratio low	≥ 0.880 times 1st gear ratio		
					Trans gear ratio not 1st gear high	≤ 1.070 times gear ratio		
					Trans gear ratio not 1st gear low	≥ 0.930 times gear ratio		
					Valid transmission gear ratio achieved time	≥ 0.500 seconds		
					OR			
					If vehicle is not launched but autostart occurs then:			
					Turbine speed	≤ 5.00 RPM		
					Turbine speed less then above threshold for	≥ 0.500 seconds		
					Note: During an autostart event the lack of hydraulic pressure will result in momentary clutch slip in			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					the C1234 clutch. After the clutch slip event, the main transmission pump and clutch will gain capacity, clutch slip will go to zero. If the vehicle is launching (moving) then a valid transmission ratio can be achieved. Or if the brake is continually applied and an autostart occurs naturally, then no ratio can be measured. In this case turbine speed will return to near zero rpm. ***************************** DTCs not fault active	 CrankSensor_FA Transmission Output Shaft Angular Velocity Validity Transmission Turbine Angular Velocity Validity Transmission Oil Temperature Validity P171A P171B P171C U0101 P182E P1915		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Performance (single turbo)	P2227	Detects a performance failure in the Barometric Pressure (BARO) sensor, such as when a BARO value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The BARO sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the BARO performance diagnostic will fail. If the BARO sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure and BARO are compared to see if their values are similar. If the MAP and Turbocharger Boost Pressure sensor values are similar, but the BARO value is not similar, then a BARO performance diagnostic will fail. When the engine is	**Engine Running:** Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update OR Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update	> 15.0 kPa <= 0.06 miles > 20.0 kPa > 0.06 miles	No Active DTCs:	AmbPresSnsrCktFA IAT_SensorFA MAF_SensorFA AfterThrottlePressureFA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA TC_BoostPresSnsrFA	320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips
			Engine Not Rotating: Barometric Pressure OR Barometric Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	< 50.0 kPa > 115.0 kPa > 10.0 kPa <= 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		running, there is an estimate of barometric pressure that is determined with the Turbocharger Boost Pressure sensor, engine air flow and engine speed. If the BARO value from the sensor is not similar to this barometric pressure estimate, then the BARO performance diagnostic will fail.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit Low (boosted applications, Gen III)	P2228	Detects a continuous short to ground in the Barometric Pressure (BARO) signal circuit by monitoring the BARO sensor output voltage and failing the diagnostic when the BARO voltage is too low. The BARO sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	BARO Voltage	< 39.3 % of 5 Volt Range (2.0 Volts = 50.0 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit High (boosted applications, Gen III)	P2229	Detects a continuous short to power or open circuit in the Barometric Pressure (BARO) signal circuit by monitoring the BARO sensor output voltage and failing the diagnostic when the BARO voltage is too high. The BARO sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	BARO Voltage	> 90.0 % of 5 Volt Range (4.5 Volts = 115.0 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Performance Bank 1 (For use with WRAF - E80	P223C	This DTC determines if the WRAF O2 sensor pumping current has an incorrect or out of range value. This DTC will detect open circuit faults to the Pump current, Ref Cell voltage, Ref Ground and Trim circuits. When enabled, the diagnostic monitors the pumping current in three different fault regions during DFCO. The individual diagnostic failure counters are incremented based on the diagnostic results in each region. The DTC is set based on any of the three individual fail and sample counters.	Fault condition present when the pump current is in any of the fault regions when this test is enabled during DFCO. Note: This ASIC is referred to as C2WRAF (Delphi).	The three pump current fault regions are: A) Pump current > 4.18 ma B) Pump current ≤ 0.10 ma and ≥ - 0.10 ma C) Pump current < -0.10 ma The three fault regions have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set. Note: A open circuit on the Pump current signal may also set a P0131 DTC. Note: A short to ground on the trim circuit can set P223C.	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) ************************** WRAF Ref cell temperature Test starts when time in DFCO Test stops when time in DFCO	P0135, P0030, P0031 or P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds ≥ 628 Deg C ≥ 5.0 seconds > 12.0 seconds	Region A: 224 failures out of 280 samples OR Region B: 224 failures out of 280 samples OR Region C: 100 failures out of 128 samples Sample rate is 25 msec. Test enabled during DFCO.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Reference Resistance Out Of Range Bank 1	P223E	This DTC determines if the WRAF O2 sensor reference cell has an incorrect or out of range resistance value. This test compares the element's resistance (from the WRAF sensor Application-Specific Integrated Circuit (ASIC)) to the expected values for the enabled condition. The element temperature is directly related to the element resistance based on the released sensor element specifications. The diagnostic failure counter is incremented if the element temperature is outside the expected range. This DTC is set based on the fail and sample counters.	Measured Reference cell temperature	< 700 Deg C OR > 1,000.0 Deg C	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) Then Delay after WRAF circuit diagnostic delay **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds ≥ 10.0 seconds	128 failures out of 160 samples Sample rate is 25 msec Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve - Mechanical Turbocharger with wastegate. Not supercharger with mechanical compressor	P2261	This DTC indicates if the compressor recirculation valve is permanent closed. This diagnostic is activ in coast conditions where the pulsation of the airflow is observed.	When measuring time accumulated air mass flow derivate boost pressure is high pass filtered with filter frequency ***************************** A failure is detected when Acc. Filtered Air Mass Flow or Acc.Der.Filtered boost pressure	< 0.40 Second, = 14.00 Hz ************************* > 80.00 g/s > 5,000.00 kPa/s	Diagnostic enabled ***************************** Engine speed ***************************** Bypass valve commanded open duty cycle For at least ***************************** Pressure ratio over the compressor relative limit Condition keep true for x seconds extra ***************************** Negative transient -> TRUE Relative boost and Pressure derivate Hysteresis negative transient -> FALSE Relative boost or Pressure derivate ***************************** No Active DTCs:	True ***************************** >= 1,500 rpm ***************************** > 6.00 % >= 0.10 s ***************************** > refer to **P00C4_P2261_KtBSTD_r_SurgeLim** in Supporting Tables 0.80 s ***************************** TRUE >= 25.00 kPa <= -150.00 kPa/s < 0.00 kPa > 10.00 kPa/s ***************************** BSTR_b_TurboBypassCktFA BSTR_b_BoostSnsrFA MAF_SensorFA	10 Failed tests out of 10 tests 25ms/ sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Coolant Pump Relay Control Circuit	P2600	Controller specific output driver circuit diagnoses the Auxillary Coolant Pump Relay Control Circuit low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between signal and controller ground.	Run Crank Ignition in Range Engine not cranking == Above is true and == Last Open Circuit Test	= True = True ==================== not Indeterminate	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips Note: In certian controllers P2602 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Coolant Pump Relay Control Circuit Low Voltage	P2602	Controller specific output driver circuit diagnoses the Auxiliary Coolant Pump Relay Control Circuit low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	Run Crank Ignition in Range Engine not cranking == Above is true and == Last Open Circuit Test	= True = True ==================== not Indeterminate	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips Note: In certian controllers P2600 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Coolant Pump Relay Control Circuit High Voltage	P2603	Controller specific output driver circuit diagnoses the Auxiliary Coolant Pump Relay Control Circuit low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power.	Run Crank Ignition in Range Engine not cranking == Above is true and == Last Open Circuit Test	= True = True ==================== not Indeterminate	5 failures out of 6 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Fuel Pump Control Module	U0109	This DTC monitors for a loss of communication with the fuel pump control module	Message is not received from controller for Message $1EB Message $4D9	 ≥ 12.0 seconds ≥ 12.0 seconds	General Enable Criteria: U0073 Normal CAN transmission on Bus A Device Control High Voltage Virtual Network Management Ignition Voltage Criteria: Run/Crank Ignition voltage Power Mode Off Cycle Enable Criteria: KeCAND_b_OffKeyCycleDiagEnbl Ignition Accessory Line and Battery Voltage General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is	 Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 1 (1 indicates enabled) = Active > 11.00 Volts	Diagnostic runs in 12.5 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for U0109 Fuel Pump Control Module	> 0.4000 seconds Not Active on Current Key Cycle is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication LIN Bus 3 Off	U1347	This DTC monitors for a LIN bus 3 off condition	LIN bus off failures	>= 3.00 counts	The following criteria have been enabled for Power Mode Run/Crank Voltage	>= 400.00 milliseconds =Run >= 11.00 Volts	Dependent on bus loading.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
LIN Bus 3 Loss of Communication with Stop-Start Control Module (UltraCap)	U135C	This DTC monitors for a loss of communication on the LIN bus 3 with UltraCap Module	ECM has lost communication over the LIN bus 3 with the UltraCap Module for	>= 3.00 counts	The following criteria have been enabled for Power Mode Run/Crank Voltage	>= 400.00 milliseconds =Run >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
LIN Bus 1 Lost Communication with Device 0 (Shutter 1)	U1510	This DTC monitors for a loss of communication on the LIN bus with Shutter 1	ECM has lost communication over the LIN bus with Device 0 / Shutter 1 for	>= 3.00 counts	The following criteria have been enabled for Power Mode Run/Crank Voltage	>= 400.00 milliseconds =Run >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Flow Insufficient	P00B7	This DTC detects a Insufficient Flow Condition in the main cooling circuit. This check is done when all known restrictions in the system such as a thermostat are open and allowing coolant to flow through the radiator. DTC indication can be caused by a stuck closed thermostat or other unexpected restriction in the cooling system.	Engine Coolant Temp (ECT) is AND Difference between ECT and RCT (Radiator Coolant Temp) is When above is present for fail counts start.	> 120.0 Deg C > 40.0 Deg C > 5 seconds	No Active DTC's Engine run time AND Engine Coolant Temp	THMR_RCT_Sensor_Ckt_FA THMR_ECT_Sensor_Ckt_FA > 300 seconds > 80.0 Deg C	30 failures out of 300 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Incorrect Airflow (for single valve systems)	P0411	Detects an insufficient flow condition.This test is run during Phase 1 (AIR pump commanded On, Valve commanded Open).Leaks downstream of the valve are detected via an evaluation of average pressure error and average “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 leaks or blockages.	Average Pressure Error or OR the following String Length (SL) Test: Average Pressure Error or and the Average String Length NOTE: Average Pressure Error is the average difference between the predicted pressure and the measured pressure	> 5.00 kPa < -4.90 kPa > 1.00 kPa < -1.00 kPa **P0411 SL Threshold** < **Bank 1 Table**	BARO Inlet Air Temp Coolant Temp Engine off time System Voltage MAP not Engine Speed MAF not SL Stability time SL RPM range No active DTCs:	> 60 kPa > -10.0 deg C > -10.0 deg C < 80.0 > 3,600.0 seconds > 10.0 Volts < 32.0 < 20 kPa for 2.0 sec < 5,000 RPM > 50 gm/s for 3.0 sec > 5.00 seconds Bank 1 > 5.00 seconds Bank 2 < 6,000 RPM or > 6,500 AIRSystemPressureSensor FA AIRValveControlCircuit FA AIRPumpControlCircuit FA MAF_SensorFA AmbientAirDefault IAT_SensorFA ECT_Sensor_FA EngineMisfireDetected_FA CatalystSysEfficiencyLoB1_FA CatalystSysEfficiencyLoB2_FA P0606 IgnitionOutputDriver_FA FuelInjectorCircuit_FA	Phase 1 Conditional test weight > 7.0 seconds Total 'String Length' accumulation time: > 10.00 sec Bank1 > 10.00 sec Bank2 Frequency: Once per trip when AIR pump commanded On Conditional test weight is calculated by multiplying the following Factors: **P0411 Phase 1 Baro Test Weight Factor , P0411 Phase 1 MAF Test Weight Factor , P0411 Phase 1 System Volt Test Weight Factor , P0411 Phase 1 Amb Temp Test Weight Factor** (see Supporting Tables)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Solenoid Control Circuit Open	P0412	Diagnoses the Secondary AIR Solenoid Control Low Side Driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: >= 200K Ohms impedance between signal and controller ground	Powertrain Relay Voltage	>= 11.00 volts	20 failures out of 25 samples 250ms / sample	Type B, 2 Trips Note: In certain controllers P041F may also set (Secondary AIR solenoid control circuit low voltage)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Pump Control Circuit Open	P0418	Diagnoses the Secondary AIR Pump Control Low Side Driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: >= 200K Ohms impedance between signal and controller ground	Powertrain relay Voltage	>= 11.00 volts	20 failures out of 25 samples 250ms / sample	Type B, 2 Trips Note: In certain controllers P2257 may also set (Secondary AIR Pump Control Circuit Low Voltage)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Solenoid Control Circuit Low Voltage	P041F	Diagnoses the Secondary AIR Solenoid Control Low Side Driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground)	Short to ground: <= 0.5 Ohms impedance between signal and controller ground	Powertrain relay Voltage	>= 11.00 volts	20 failures out of 25 samples 250ms / sample	Type B, 2 Trips Note: In certain controllers P0412 may also set (Secondary AIR solenoid control circuit Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Solenoid Control Circuit High Voltage	P044F	Diagnoses the Secondary AIR Solenoid Control Low Side Driver circuit for circuit faults	Voltage high during driver on state (indicates short-to-power)	Short to power: <= 0.5 Ohms impedance between signal and controller power	Powertrain relay Voltage	>= 11.00 volts	20 failures out of 25 samples 250ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Thermostat Heater Control Open Circuit	P0597	Controller specific output driver circuit diagnoses the Thermostat Heater Control sided driver for an open circuit failure. When the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	Open Circuit: ≥ 200 K Ω impedance between signal and controller ground.	Run Crank Ignition in Range Engine not cranking Run Crank active == Above is true and == Last Open Circuit Test	= True = True = True =================== = not Indeterminate	15 failures out of 30 samples 1 sec/ sample Continuous	Type B, 2 Trips Note: In certian controllers P0598 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Thermostat Heater Control Circuit Low	P0598	Controller specific output driver circuit diagnoses the Thermostat Heater low sided driver for a short to ground failure. A DTC is set when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Run Crank Ignition in Range Engine not cranking Run Crank active == Above is true and == Last Ground Short Circuit Test	= True = True = True ================ = not Indeterminate	15 failures out of 30 samples 1 sec/ sample Continuous	Type B, 2 Trips Note: In certian controllers P0597 may also set

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Thermostat Heater Control Circuit High	P0599	Controller specific output driver circuit diagnoses the Thermostat Heater low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	Short to power: ≤ 0.5 Ω impedance between signal and controller power.	Run Crank Ignition in Range Engine not cranking Run Crank active == Above is true and == Last Power Short Circuit Test	= True = True = True ================== = not Indeterminate	15 failures out of 30 samples 1 sec/ sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Manifold Tuning (IMT) Valve Solenoid Control Circuit Bank 1	P0660	Diagnoses the Intake Manifold Tuning (IMT) Valve low side driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: >= 200K Ohms impedance between signal and controller ground	Powertrain Relay Voltage Engine Speed	>= 11.00 Volts >= 400 RPM	40 failures out of 50 samples 1 sample every 12.5 msec	Type B, 2 Trips Note in certain controllers P0661 may also set (Intake Manifold Tuning (IMT) Valve Solenoid Control Circuit Low Voltage Bank 1)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Manifold Tuning (IMT) Valve Solenoid Control Circuit Low Voltage Bank 1	P0661	Diagnoses the Intake Manifold Tuning (IMT) Valve low side driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground or open circuit)	Short to ground: <= 0.5 Ohms impedance between signal and controller ground Open Circuit: >= 200K Ohms impedance between signal and controller ground	Powertrain Relay Voltage Engine Speed	>= 11.00 Volts >= 400 RPM	40 failures out of 50 samples 1 sample every 12.5 msec	Type B, 2 Trips Note in certain controllers P0660 may also set (Intake Manifold Tuning (IMT) Valve Solenoid Control Circuit Bank 1)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Manifold Tuning (IMT) Valve Solenoid Control Circuit High Voltage Bank 1	P0662	Diagnoses the Intake Manifold Tuning (IMT) Valve low side driver circuit for circuit faults	Voltage low during driver on state (indicates short-to-power)	Short to power: <= 0.5 Ohms impedance between signal and controller power	Powertrain Relay Voltage Engine Speed	>= 11.00 Volts >= 400 RPM	40 failures out of 50 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Manifold Tuning (IMT) Valve Position Sensor/ Switch Circuit Range/ Performance	P2076	Detects an Intake Manifold Tuning Valve Actuator that has initiated its learn sequence for too long a period of time, or too many times per ignition cycle	Valve Position AND Valve Position for a time period OR Valve Position AND Valve Position for a time period for	>= 5.0 % <= 35.0 % >= 5.0 seconds >= 5.0 % <= 35.0 % >= 0.2 seconds >= 10 times in one ignition cycle	Powertrain Relay Voltage Powertrain Relay Voltage Engine Run Time	>= 11.00 Volts <= 999.00 Volts >= 1.0 seconds	Executes every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Manifold Tuning (IMT) Valve Position Sensor/ Switch Circuit Low	P2077	Detects a continuous open or short to low in the Intake Manifold Tuning Valve Position Sensor circuit	Valve Position	>= 95.0 %	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Manifold Tuning (IMT) Valve Position Sensor/ Switch Circuit High	P2078	Detects a continuous short to high in the Intake Manifold Tuning Valve Position Sensor circuit	Valve Position	<= 5.0 %	Continuous		320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Pump Control Circuit Low Voltage	P2257	Diagnoses the Secondary AIR Pump Control Low Side Driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground)	Short to ground: <= 0.5 Ohms impedance between signal and controller ground	Powertrain relay Voltage	>= 11.00 volts	20 failures out of 25 samples 250ms / sample	Type B, 2 Trips Note: In certain controllers P0418 may also set (Secondary AIR Pump Control Circuit Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR Pump Control Circuit High Voltage	P2258	Diagnoses the Secondary AIR Pump Control Low Side Driver circuit for circuit faults	Voltage high during driver on state (indicates short-to-power)	Short to power: <= 0.5 Ohms impedance between signal and controller power	Powertrain relay Voltage	>= 11.00 volts	20 failures out of 25 samples 250ms / sample	Type B, 2 Trips

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 Bank 1	P2430	This DTC detects a stuck in range pressure sensor signal when the AIR pump is commanded on.	Average Pressure Error AND Signal Variation	< 0.50 kPa < 1.00 kPa	BARO Inlet Air Temp Coolant Temp Engine off time System Voltage MAP not Engine Speed MAF not No active DTCs:	> 60 kPa > -10.0 deg C > -10.0 deg C < 80.0 > 3,600.0 seconds > 10.0 Volts < 32.0 < 20 kPa for 2.0 sec < 5,000 RPM > 50 gm/s for 3.0 sec AIRValveControlCircuit FA AIRPumpControlCircuit FA P2432 P2437 P2433 P2438 P0606	Stuck in range cumulative time > 5.0 seconds Frequency: Once per trip when SAI pump is commanded On	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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 OR Difference between AIR pressure sensor and BARO (Pump Commanded On)	> 15.00 kPa < -15.0 kPa > 15.00 kPa	BARO Inlet Air Temp Coolant Temp Engine off time System Voltage MAP not Engine Speed MAF not Transfer Case not in 4WD Low Run/crank active No active DTCs:	> 60 kPa > -10.0 deg C > -10.0 deg C < 80.0 > 3,600.0 seconds > 10.0 Volts < 32.0 < 20 kPa for 2.0 sec < 5,000 RPM > 50 gm/s for 3.0 sec AIRValveControlCircuit FA AIRPumpControlCircuit FA P2432 P2437 P2433 P2438 MAF_SensorFA EngineMisfireDetected_FA P0606	Skewed sensor cumulative test weight > 30.0 seconds Continuous 6.25ms loop Skewed sensor cumulatative test weight is based on distance from the last Baro update. See **P2431_P2436 Baro Skewed Sensor Weight Factor** table.	Type B, 2 Trips

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 Low Voltage Bank 1	P2432	This DTC detects an out of range low AIR pressure sensor signal	AIR Pressure Sensor signal	< 6 % of 5Vref for 800 failures out of 1,000 samples	No active DTCs:	P0606	1,000 samples (6.25 ms per sample) Continuous	Type B, 2 Trips

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	> 94 % of 5Vref for 800 failures out of 1,000 samples	No active DTCs:	P0606	1,000 samples (6.25 ms per sample) Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR System Shut-off Valve Stuck Open (for single valve systems)	P2440	This DTC detects if one or both of the AIR system control valves is stuck openThis test is run during Phase 2 (Pump commanded On, valve commanded closed)	Average Pressure Error or	< **P2440 Bank 1 Valve Pressure Error** table > 32 kPa	BARO Inlet Air Temp Coolant Temp Engine off time System Voltage MAP not Engine Speed MAF not Stability Time AIR diagnostic Phase 1 passed No active DTCs:	> 60 kPa > -10.0 deg C > -10.0 deg C < 80.0 > 3,600.0 seconds > 10.0 Volts < 32.0 < 20 kPa for 2.0 sec < 5,000 RPM > 50 gm/s for 3.0 sec > 0.5 seconds AIRSystemPressureSensor FA AIRValveControlCircuit FA AIRPumpControlCircuit FA MAF_SensorFA AmbientAirDefault IAT_SensorFA ECT_Sensor_FA EngineMisfireDetected_FA CatalystSysEfficiencyLoB1_FA CatalystSysEfficiencyLoB2_FA P0606 IgnitionOutputDriver_FA FuelInjectorCircuit_FA	Phase 2 Conditional test weight > 1.5 sec Frequency: Once per trip when AIR pump commanded On Conditional test weight is calculated by multiplying the following Factors: **P2440 Phase 2 Baro Test Weight Factor , P2440 Phase 2 MAF Test Weight Factor , P2440 Phase 2 System Volt Test Weight Factor , P2440 Phase 2 Amb Temp Test Weight Factor** (see Supporting Tables)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Secondary AIR System Pump Stuck On (for single valve systems)	P2444	This DTC detects if the SAI pump is stuck On. This test is run during Phase 3 (Pump commanded Off, valve commanded closed)	Average Pressure Error or	> **P2444 Bank 1 Pump Pressure Error** table < -32 kPa	BARO Inlet Air Temp Coolant Temp Engine off time System Voltage MAP not Engine Speed MAF not Stability Time AIR diagnostic Phase 1 passed AIR diagnostic Phase 2 passed No active DTCs:	> 60 kPa > -10.0 deg C > -10.0 deg C < 80.0 > 3,600.0 seconds > 10.0 Volts < 32.0 < 20 kPa for > 2.0 sec < 5,000 RPM > 50 gm/s for > 3.0 sec > 4.0 seconds Phase 3 cumulatative test weight is based on the distance from the last Baro update. See **P2431_P2436 Baro Skewed Sensor Weight Factor** table. AIRSystemPressureSensor FA AIRValveControlCircuit FA AIRPumpControlCircuit FA MAF_SensorFA AmbientAirDefault IAT_SensorFA ECT_Sensor_FA EngineMisfireDetected_FA CatalystSysEfficiencyLoB1_FA CatalystSysEfficiencyLoB2_FA P0606 IgnitionOutputDriver_FA FuelInjectorCircuit_FA	Phase 3 Cumlatative test weight > 2.0 sec. Frequency: Once per trip when AIR pump is commanded On	Type A, 1 Trips

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 (mid-park phaser)	P0016	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 1 sensor A occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	2 cam sensor pulses less than or greater than nominal position in one cam revolution.	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0340, P0341 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 trips

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 B (mid-park phaser)	P0017	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 1 sensor B occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	. 2 cam sensor pulses less than or greater than nominal position in one cam revolution..	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0365, P0366 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 trips

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 2 Sensor A (mid-park phaser)	P0018	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 2 sensor A occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	2 cam sensor pulses less than or greater than nominal position in one cam revolution..	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	 CrankSensor_FA P0345, P0346 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 trips

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 2 Sensor B (mid-park phaser)	P0019	Detects cam to crank misalignment by monitoring if the cam sensor pulse for bank 2 sensor B occurs during the incorrect crank position, diagnostic passes when the cam sensor pulse is in the expected range	2 cam sensor pulses less than or greater than nominal position in one cam revolution..	-6.9 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic	CrankSensor_FA P0390, P0391 < 1.0 seconds	2 failures out of 3 tests. A failed test is 4 failures out of 5 samples. After the first failed test, there is a delay until the camshaft phaser control logic verifies and reports that the camshaft is actually parked. One sample per cam rotation	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger/ Supercharger Bypass Valve B Control Circuit If two parallel turbos are present.	P00C0	Controller specific output driver circuit diagnoses the 'compressor recirculation valve 'B' actuator' low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'B' is the second turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'B' is associated with engine bank 2.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedence between signal and controller ground.	Diagnostic enabled ***************************** Powertrain relay Voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P00C1 may also set turbocharger/ supercharger bypass valve B control circuit low

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger/ Supercharger Bypass Valve B Control Circuit Low If two parallel turbos are present.	P00C1	Controller specific output driver circuit diagnoses the 'compressor recirculation valve 'B' actuator' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'B' is the second turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'B'is associated with engine bank 2.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P00C0 may also set turbocharger/ supercharger bypass valve B control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger/ Supercharger Bypass Valve B Control Circuit High If two parallel turbos are present.	P00C2	Controller specific output driver circuit diagnoses the 'compressor recirculation valve 'B' actuator' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'B' is the second turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'B'is associated with engine bank 2.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller power	Diagnostic enabled ***************************** Powertrain relay Voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger/ Supercharger Bypass Valve B - Mechanical If two parallel turbos are present.	P00C4	This DTC indicates if the compressor recirculation valve is permanent closed. This diagnostic is activ in coast conditions where the pulsation of the asirflow is observed.	When measuring time accumulated air mass flow is high pass filtered with filter frequency ***************************** A failure is detected when Filtered Air Mass Flow	< 0.40 second, = 14.00 Hz ************************** >= 80.0 g/s	Diagnostic enabled ***************************** Engine speed ***************************** Bypass Valve Commanded Open Duty Cycle For at least ***************************** Pressure ratio over the compressor relative limit Condition keep true for ***************************** Negative transient -> TRUE Relative Boost and Pressure derivate Hysteresis negative transient ->FALSE Relative Boost or Pressure derivate ***************************** No active DTCs:	True ***************************** >= 1,500 rpm ***************************** > 6.00 % >= 0.10 s ***************************** > refer to **P00C4_P2261_KtBSTD_r_SurgeLim** in Supporting Tables 0.80 seconds ***************************** TRUE >= 25.00 kPa <= -150.00 kPa/s < 0.00 kPa > 10.00 kPa/s ***************************** BSTR_b_TurboBypassCktFA BSTR_b_BoostSnsrFA MAF_SensorFA	10 Failed tests out of 10 tests 25ms / sample	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Pressure Measurement System - Multiple Sensor Correlation (twin turbo)	P00C7	Detects an inconsistency between pressure sensors in the induction system in which a particular sensor cannot be identified as the failed sensor. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Manifold Pressure (MAP), Turbocharger Boost Pressure, Barometric Pressure (BARO) and BARO B sensors values are checked to see if they are within the normal expected atmospheric pressure range. If they are, then MAP, Turbocharger Boost Pressure, BARO and BARO B are compared to see if their values are similar. If three of these four sensors are similar, but the fourth is not, then a performance diagnostic for the specific sensor with the dissimilar value will fail. If there is no	See table **P00C7: Twin Turbo Failure Matrix** for the malfunction criteria for this diagnostic. Certain failure combinations in this matrix will set other DTCs if the failures can be correlated to a single sensor. The definition of the column headings is as follows: "MAP & TCBP Diff" = Y if: ABS(Turbocharger Boost Pressure - Manifold Pressure) "MAP & Baro Diff" = Y if: ABS(Baro Pressure - Manifold Pressure) "MAP & Baro B Diff" = Y if: ABS(Baro Pressure B - Manifold Pressure) "TCBP & Baro Diff" = Y if: ABS(Turbocharger Boost Pressure - Baro Pressure) "TCBP & Baro B Diff" = Y if:	 > 10.0 kPa > 10.0 kPa > 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating Manifold Pressure Manifold Pressure Baro Pressure Baro Pressure Baro Pressure B Baro Pressure B Turbocharger Boost Pressure Turbocharger Boost Pressure No Active DTCs: No Pending DTCs:	> 10.0 seconds >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa EngineModeNotRunTimer Error MAP_SensorFA AAP_SnsrFA AAP2_SnsrFA AAP3_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP3_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		combination of three of these four sensors that is similar, then the failed sensor cannot be uniquely identified. The Multiple Pressure Sensor Correlation Diagnostic will fail in this case.	ABS(Turbocharger Boost Pressure - Baro Pressure B) "Baro & Baro B Diff" = Y if: ABS(Baro Pressure - Baro Pressure B)	> 10.0 kPa > 10.0 kPa				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow System Performance (twin turbo)	P0101	Detects a performance failure in the Mass Air Flow (MAF) sensor, such as when a MAF value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the MAF B sensor, Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAF sensor. In this case, the MAF Performance diagnostic	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. For P0101: MAF model fails when MAF1 model fails. MAF1 model fails when: ABS(Measured MAF1 Flow – Modeled MAF1 Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error	> 20.0 grams/sec > 25.0 kPa > 25.0 kPa > 25.0 kPa > 30.0 kPa > 225 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,500 RPM >= -7 Deg C =TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled MAF1 Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		will fail.	TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow	 > 30.0 kPa > 30.0 kPa > 1.5 seconds > 1.5 seconds > a threshold in	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				gm/sec as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**				
			AND Manifold Pressure	> a threshold in kPa as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP**				
			AND Filtered Mass Air Flow - Mass Air Flow	< 2.0 gm/sec				
			Low Engine Air Flow is TRUE when Mass Air Flow	< a threshold in gm/sec as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow**				
			AND Manifold Pressure	< a threshold in kPa as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP**				
			AND Mass Air Flow - Filtered Mass Air Flow	< 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Manifold Absolute Pressure Sensor Performance (twin turbo)	P0106	Detects a performance failure in the Manifold Pressure (MAP) sensor, such as when a MAP value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The MAP sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the MAP performance diagnostic will fail. If the MAP sensor value is within the normal expected atmospheric range, then MAP, Turbocharger Boost Pressure, Barometric Pressure (BARO) and BARO B are compared to see if their values are similar. If the Turbocharger Boost Pressure, BARO and BARO B sensor values are similar, but the MAP value is not similar, then a MAP performance diagnostic will fail.	<u>**Engine Running:**</u> See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when either MAF1 model fails or MAF2 model fails. MAF1 model fails when: ABS(Measured MAF1 Flow – Modeled MAF1 Flow) Filtered MAF2 model failres when: ABS(Measured MAF2 Flow – Modeled MAF2 Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered	> 20.0 grams/sec > 20.0 grams/sec > 25.0 kPa > 25.0 kPa > 25.0 kPa > 30.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,500 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled MAF1 Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** Modeled MAF2 Error multiplied by **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on MAF Est** and **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on RPM**	Continuous Calculation are performed every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, MAF B sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAP sensor. In this case, the MAP Performance diagnostic will fail.	TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has	> 225 kPa*(g/s) > 30.0 kPa > 30.0 kPa > 1.5 seconds	No Active DTCs:	MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure	> 1.5 seconds > a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 2.0 gm/sec < a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table	 No Pending DTCs:	IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				
			<u>Engine Not Rotating:</u> Manifold Pressure OR Manifold Pressure OR ABS(Manifold Pressure - Turbocharger Boost Pressure) AND ABS(Manifold Pressure - Baro Pressure) AND ABS(Manifold Pressure - Baro Pressure B) AND ABS(Turbocharger Boost Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure B) AND ABS(Baro Pressure - Baro Pressure B)	< 50.0 kPa > 115.0 kPa > 10.0 kPa > 10.0 kPa > 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP3_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP3_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass or Volume Air Flow B Circuit Range/ Performance	P010B	Detects a performance failure in the Mass Air Flow (MAF) B sensor, such as when a MAF B value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the MAF sensor, Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAF B sensor. In this case, the MAF B Performance diagnostic	See table **Turbocharger P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. For P010B: MAF model fails when MAF2 model fails. MAF2 model fails when ABS(Measured MAF2 Flow – Modeled MAF2 Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error	> 20.0 grams/sec > 25.0 kPa > 25.0 kPa > 25.0 kPa > 30.0 kPa > 225 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,500 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled MAF2 Error multiplied by **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on MAF Est** and **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on RPM** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by	Continuous Calculation are performed every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		will fail.	TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when	> 30.0 kPa > 30.0 kPa > 1.5 seconds > 1.5 seconds	No Active DTCs: No Pending DTCs:	**P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Mass Air Flow	> a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**				
			AND Manifold Pressure	> a threshold in kPa TIAP-MAP as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP**				
			AND Filtered Mass Air Flow - Mass Air Flow	< 2.0 gm/sec				
			Low Engine Air Flow is TRUE when Mass Air Flow	< a threshold in gm/sec as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow**				
			AND Manifold Pressure	< a threshold in kPa as a function of engine speed. See table				
			-					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow B Sensor Circuit Low Frequency	P010C	Detects a continuous short to ground in the MAF B sensor circuit or a MAF B sensor that is outputting a frequency that is too low. The diagnostic monitors the MAF B sensor frequency output and fails the diagnostic when the MAF B frequency is too low. The MAF B sensor monitors the temperature of a circuit in the air flow of the engine. The temperature of this circuit is related to the air velocity across the sensor. The MAF B sensor converts this air velocity to a mass air flow value. The mass air flow value is converted by the sensor to a frequency value in Hertz. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the frequency of the square wave signal and converts that frequency to a mass air flow value in grams/second through a transfer function.	MAF B Output	<= 400 Hertz (~ 0.47 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Above criteria present for a period of time	> 0.0 seconds >= 300 RPM >= 10.0 Volts >= 1.0 seconds	300 failures out of 375 samples 1 sample every cylinder firing event	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Mass Air Flow B Sensor Circuit High Frequency	P010D	Detects a MAF B sensor that is outputting a frequency signal that is too high. The diagnostic monitors the MAF B sensor frequency output and fails the diagnostic when the MAF B frequency is too high. The MAF B sensor monitors the temperature of a circuit in the air flow of the engine. The temperature of this circuit is related to the air velocity across the sensor. The MAF B sensor converts this air velocity to a mass air flow value. The mass air flow value is converted by the sensor to a frequency value in Hertz. A digital square wave signal is transmitted by the sensor to the ECM. The ECM calculates the frequency of the square wave signal and converts that frequency to a mass air flow value in grams/second through a transfer function.	MAF B Output	>= 14,500 Hertz (~ 500.0 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Above criteria present for a period of time	> 0.0 seconds >= 300 RPM >= 10.0 Volts >= 1.0 seconds	300 failures out of 375 samples 1 sample every cylinder firing event	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Sensor Performance (twin turbo)	P0121	Detects a performance failure in the Throttle Position sensor (TPS) sensor, such as when a TPS value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor, Mass Air Flow (MAF) sensor and MAF B sensor. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the TPS sensor. In this case, the TPS	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when either MAF1 model fails or MAF2 model fails. MAF1 model fails when ABS(Measured MAF1 Flow – Modeled MAF1 Flow) Filtered MAF2 model fails when ABS(Measured MAF2 Flow – Modeled MAF2 Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered	> 20.0 grams/sec > 20.0 grams/sec > 25.0 kPa > 25.0 kPa > 25.0 kPa > 30.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,500 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled MAF1 Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** Modeled MAF2 Error multiplied by **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on MAF Est** and	Continuous Calculation are performed every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Performance diagnostic will fail.	TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is	> 225 kPa*(g/s) > 30.0 kPa > 30.0 kPa > 1.5 seconds > 1.5 seconds	No Active DTCs: -	**P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on RPM** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			TRUE when Mass Air Flow AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure -	> a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 2.0 gm/sec < a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table	No Pending DTCs:	EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 1 Sensor 1 (For use with WRAF - E81	P0131	This DTC determines if the WRAF O2 sensor signal circuit is shorted low. This DTC will detect a short to ground fault to the Pump Current, Reference Cell Voltage and Reference Ground circuits. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B1S1 WRAF ASIC indicates a ground short to any of the following WRAF signals: A) Pump Current - short to ground fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to ground fail counts are accumulated to determine fault status. C) Reference Ground - short to ground fail counts are accumulated to determine fault status. <u>Note</u>: This ASIC is referred to as ATIC142 (Continental). <u>Note</u>: A ground short on the Pump Current or Reference Voltage signal may also set a P223C DTC.	The ASIC provides a fault indication when the pump current, reference cell or reference ground pin is < 150mV. Note: the faults must exist for previous 100 milli - seconds to qualify for a fail flag. The three fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop WRAF Ref cell temperature ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True ≥ 628 Deg C = Complete ≥ 20.0 seconds	Signal A: 128 failures out of 160 samples OR Signal B: 128 failures out of 160 samples OR Signal C: 128 failures out of 160 samples Continuous in 25 milli - second loop	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 1 Sensor 1 (For use with WRAF - E81	P0132	This DTC determines if the WRAF O2 sensor signal circuit is shorted high. This DTC will detect a short to power fault to the Pump Current (and Trim circuit), Reference Cell Voltage and Reference Ground circuit. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B1S1 WRAF ASIC indicates a short to power on any of the following WRAF signals: A) Pump Current - short to power fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to power fail counts are accumulated to determine fault status. C) Reference Ground - short to power fail counts are accumulated to determine fault status. <u>Note</u>: This ASIC is referred to as ATIC142 (Continental)..	The ASIC provides a fault indication when the pump current, reference cell or reference ground pin is ≥ 5.2V. Note: the faults must exist for more than 1 msec to qualify for a fail flag. The three fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid Status (ASIC) Controller status (ASIC) Engine Run or Auto stop WRAF Ref cell temperature ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True ≥ 628 Deg C = Complete ≥ 20.0 seconds	Signal A: 128 failures out of 160 samples OR Signal B: 128 failures out of 160 samples OR Signal C: 128 failures out of 160 samples Frequency: Continuous in 25 milli - second loop	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 2 Sensor 1 (For use with WRAF - E81	P0151	This DTC determines if the WRAF O2 sensor signal circuit is shorted low. This DTC will detect a short to ground fault to the Pump Current, Reference Cell Voltage and Reference Ground circuits. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B2S1 WRAF ASIC indicates a ground short to any of the following WRAF signals: A) Pump Current - short to ground fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to ground fail counts are accumulated to determine fault status. C) Reference Ground - short to ground fail counts are accumulated to determine fault status. Note: This ASIC is referred to as ATIC142 (Continental). Note: A ground short on the Pump Current or Reference Voltage signal may also set a P223D DTC.	The ASIC provides a fault indication when the pump current, reference cell or reference ground pin is < 150mV. Note: the faults must exist for more than 83.3us to qualify for a fail flag. The three fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B2S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop WRAF Ref cell temperature ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0155, P0050, P0051 or P0052 = Valid = Ready = True ≥ 628 Deg C = Complete ≥ 20.0 seconds	Signal A: 128 failures out of 160 samples OR Signal B: 128 failures out of 160 samples OR Signal C: 128 failures out of 160 samples Continuous in 25 milli - second loop	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 2 Sensor 1 (For use with WRAF - E81	P0152	This DTC determines if the WRAF O2 sensor signal circuit is shorted high. This DTC will detect a short to power fault to the Pump Current (and Trim circuit), Reference Cell Voltage and Reference Ground circuit. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B2S1 WRAF ASIC indicates a short to power on any of the following WRAF signals: A) Pump Current - short to power fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to power fail counts are accumulated to determine fault status. C) Reference Ground - short to power fail counts are accumulated to determine fault status. <u>Note</u>: This ASIC is referred to as ATIC142 (Continental).	The ASIC provides a fault indication when the pump current, reference cell or reference ground pin is ≥ 5.2V. Note: the faults must exist for more than 83.3us to qualify for a fail flag. The three fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B2S1 DTC's Not active this key cycle Measure Valid Status (ASIC) Controller status (ASIC) Engine Run or Auto stop WRAF Ref cell temperature ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0155, P0050, P0051 or P0052 = Valid = Ready = True ≥ 628 Deg C = Complete ≥ 20.0 seconds	Signal A: 128 failures out of 160 samples OR Signal B: 128 failures out of 160 samples OR Signal C: 128 failures out of 160 samples Frequency: Continuous in 25 milli - second loop	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Rich to Lean Bank 2 Sensor 1) (For use with WRAF	P015C	DTC P015C detects that the primary WRAF oxygen sensor for Bank 2 has delayed response when the air fuel ratio transitions from rich to lean condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor rich to lean tests (P014A / P013C / P2273), which commands fuel cut off. Note: The Primary method is used when the WRAF O2 sensor signal transitions from above to below the O2 measured EQR threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P015C diagnostic measures the primary WRAF O2 sensor response time between a rich condition above a starting measured EQR threshold and a lower measured EQR threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air	Primary method: The EWMA of the Pre O2 sensor normalized R2L time delay value. The EWMA calculation uses a 0.25 coefficient. OR Secondary method: The Accumulated time monitored during the R2L Delayed Response Test. AND Pre WRAF O2 sensor measured EQR is above	> 0.6 EWMA (sec) ≥ 2.0 Seconds > 1.0 EQR	No Active DTC's System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault Green O2S Condition	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0151, P0152, P013C, P013D, P014A, P014B, P2272, P2273 > 10.0 Volts = Not active = Not active = Not active = Not active = False = False = Not Valid, Green O2S condition is	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		temperature resulting in a normalized delay value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015C is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary WRAF O2 sensor does not achieve the required lower measured EQR threshold before a			 O2 Heater (pre sensor) on for Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral Closed Loop Active	considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 30 seconds > 55 ºC = TRUE) > -40 ºC > 30 seconds 1,050 ≤ RPM ≤ 2,500 1,000 ≤ RPM ≤ 2,550 3.2 ≤ gps ≤ 11.5 42.3 ≤ MPH ≤ 80.2 38.5 ≤ MPH ≤ 82.0 0.87 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables).		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		delay time threshold is reached.			Evap Ethanol Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on Time Predicted Catalyst temp Fuel State ================== All of the above met for at least 3.0 seconds, and then the Force Cat Rich intrusive stage is requested. ================== Pre O2S EQR B1S1 at end of Cat Rich stage Fuel State Number of fueled cylinders ================== After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input).	not in control of purge not in estimate mode > 70 kpa = enabled = not active = not active ≥ 60.0 sec 500 ≤ ºC ≤ 880 = DFCO possible ================ =============== ≥ 1.100 EQR = DFCO active ≤ 5 cylinders ===============		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 2 Sensor 1) (For use with WRAF	P015D	DTC P015D detects that the primary WRAF oxygen sensor for Bank 2 has delayed response when the air fuel ratio transitions from lean to rich condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor lean to rich tests (P014B / P013D), which commands fuel enrichment. Note: The Primary method is used when the primary WRAF O2 sensor signal transitions from lean condition to above the O2 measured EQR threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P015D diagnostic measures the primary WRAF O2 sensor response time between a lean condition and a higher measured EQR threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in	Primary method: The EWMA of the Pre O2 sensor normalized L2R time delay value. The EWMA calculation uses a 0.25 coefficient. OR Secondary method: The Accumulated time monitored during the L2R Delayed Response Test. AND Pre WRAF O2 sensor measured EQR is OR At end of Cat Rich stage the Pre WRAF O2 sensor measured EQR is	> 0.6 EWMA (sec) ≥ 2.0 Seconds < 1.000 EQR < 1.100 EQR	No Active DTC's P015C test is complete and System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA P0151, P0152, P013C, P013D, P014A, P014B, P015C, P2272, P2273 = Passed > 10.0 Volts = Not active = Not active = Not active = Not active = False = False	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		a normalized delay value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015D is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary WRAF O2 sensor does not achieve the required higher measured EQR threshold before a delay time threshold is			Green O2S Condition O2 Heater (pre sensor) on for Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral Closed Loop Active	= Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 30 seconds > 55 ºC = TRUE) > -40 ºC > 30 seconds 1,050 ≤ RPM ≤ 2,500 1,000 ≤ RPM ≤ 2,550 3.2 ≤ gps ≤ 11.5 42.3 ≤ MPH ≤ 80.2 38.5 ≤ MPH ≤ 82.0 0.87 ≤ C/L Int ≤ 1.07 = TRUE (Please see "**Closed Loop Enable**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		reached.				**Clarification**" in Supporting Tables).		
					Evap	not in control of purge		
					Ethanol	not in estimate mode		
					Baro	> 70 kpa		
					Post fuel cell	= enabled		
					EGR Intrusive diagnostic	= not active		
					All post sensor heater delays	= not active		
					O2S Heater (post sensor) on Time	≥ 60.0 sec		
					Predicted Catalyst temp	500 ≤ ºC ≤ 880		
					Fuel State	= DFCO inhibit		
					Number of fueled cylinders	≥ 1 cylinders		
					=================	=================		
					When above conditions are met: Fuel Enrich mode is entered.			
					================	=================		
					During this test: Engine Airflow must stay between:	0 ≤ gps ≤ 13		
					and the delta Engine Airflow over 12.5msec must be :	≤ 0.8 gps		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Pressure (TIAP) Sensor Performance (twin turbo)	P0236	Detects a performance failure in the Turbocharger Boost Pressure sensor, such as when a Turbocharger Boost Pressure value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Turbocharger Boost Pressure sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the Turbocharger Boost Pressure performance diagnostic will fail. If the Turbocharger Boost Pressure sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure, Barometric Pressure (BARO) and BARO B are compared to see if their values are similar. If the MAP, BARO and BARO B sensor values are similar, but the Turbocharger Boost	<u>**Engine Running:**</u> See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when either MAF1 model fails or MAF2 model fails. MAF1 model fails when ABS(Measured MAF1 Flow – Modeled MAF1 Flow) Filtered MAF2 model fails when ABS(Measured MAF2 Flow – Modeled MAF2 Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP - TIAP Model 1) Filtered	> 20.0 grams/sec > 20.0 grams/sec > 25.0 kPa > 25.0 kPa > 25.0 kPa > 30.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 6,500 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled MAF1 Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** Modeled MAF2 Error multiplied by **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on MAF Est** and **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on RPM**	Continuous Calculation are performed every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Pressure value is not similar, then a Turbocharger Boost Pressure performance diagnostic will fail. The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, MAF B sensor, Manifold Pressure (MAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the Turbocharger Boost Pressure sensor. In this case, the	TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time	> 225 kPa*(g/s) > 30.0 kPa > 30.0 kPa > 1.5 seconds > 1.5 seconds	No Active DTCs:	MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Turbocharger Boost Pressure Performance diagnostic will fail.	High Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure -	> a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 2.0 gm/sec < a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table	No Pending DTCs:	IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				
			Engine Not Rotating: Turbocharger Boost Pressure OR Turbocharger Boost Pressure OR ABS(Manifold Pressure - Turbocharger Boost Pressure) AND ABS(Manifold Pressure - Baro Pressure) AND ABS(Manifold Pressure - Baro Pressure B) AND ABS(Turbocharger Boost Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure B) AND ABS(Baro Pressure - Baro Pressure B)	< 50.0 kPa > 115.0 kPa > 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa <= 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP3_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP3_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid B Control Circuit If two parallel turbos are present.	P0247	Controller specific output driver circuit diagnoses the 'turbocharger boost solenoid 'B' actuator' low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'B' is the second turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'B'is associated with engine bank 2.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0249 may also set turbocharger wastegate / supercharger boost solenoid B control circuit low

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid B Control Circuit Low If two parallel turbos are present.	P0249	Controller specific output driver circuit diagnoses the 'turbocharger boost solenoid 'B' actuator' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'B' is the second turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'B'is associated with engine bank 2.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0247 may also set turbocharger wastegate / supercharger boost solenoid B control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid B Control Circuit High If two parallel turbos are present.	P0250	Controller specific output driver circuit diagnoses the 'turbocharger boost solenoid 'B' actuator' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds. In a series application, turbocharger 'B' is the second turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'B'is associated with engine bank 2.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controlers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedence between signal and controller power	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine is not cranking Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	20 failures out of 40 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger or Supercharger with Intercooler	P026A	This DTC indicates bad efficiency of the Water Charge air cooler. The diagostic observe the Mainifold temperature and the time Boost is limited due to hot Manifold temperature.	Manifold temperature OR Lengthy boost limiting due to elevated manifold temperature	> 100.0 > 10,000.0	Diagnostic enabled ***************************** IC Pump enabled ***************************** Engine run time Coolant temperature ***************************** No active DTCS:	True ***************************** Activated via ICP-Control ***************************** >= 60.0 seconds >= -10.0 deg Celsius ***************************** ECT_Sensor_FA MnfdTempSensorFA	5 failures out of 10 samples. 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module O2 Sensor Processor Performance Bank 2) (For use with WRAF	P064E	Diagnoses the WRAF Application-Specific Integrated Circuit (ASIC) for Controller Status and Measure Valid faults. These faults can impact closed loop fuel control. This DTC when enabled, monitors the two different failure counters it receives from the WRAF ASIC. The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the two individual fail and sample counters.	B2S1 WRAF ASIC indicates control module faults	Controller Status fail counts and Measure Valid fail counts are accumulated to determine fault status	Engine Run or Auto stop Heater Warm-up delay WRAF circuit diagnostic delay since power up	= True = Complete ≥ 20.0 sec	128 controller status fail counts out of 160 samples OR 128 measure valid fail counts out of 160 samples 25 ms / sample Continuous	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Shared High Side Drive #1 Control Circuit Low (STG) - (GEN III Controllers ONLY)	P0658	Controller specific output driver circuit diagnoses the shared high sided driver # 1 for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	- Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. - Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	Shared high side drive #1 low diag enable Powertrain relay voltage Run Crank voltage Powertrain relay state	= 1 >= 11.00 > 5.00 = ON	20 failures out of 25 samples 100 ms / sample	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Shared High Side Drive #1 Control Circuit High (STP) - (GEN III Controllers ONLY)	P0659	Controller specific output driver circuit diagnoses the shared high sided driver # 1 for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	- Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. - Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	Shared high side drive #1 diag enable Powertrain relay voltage Run Crank voltage Powertrain relay state	= 1 >= 11.00 > 5.00 = ON	20 failures out of 25 samples 100 ms / sample	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Two Stage Oil Pump Control Circuit StuckOn - Two Sided	P06DE	Diagnoses the two stage oil pump is stuck in the low pressure state. This diagnostic includes an intrusive test and a passive test. Intrusive test: The oil pump control is cycled off (high pressure) and on (low pressure) Y times at calibratable intervals. If a change in oil pressure above a calibration is not detected then the oil pressure is checked to determine if it is stuck. It takes X-out-of-Y failures to fail and set the appropriate code. Passive test: After the intrusive test passes, then a passive test will begin to run. The passive test will monitor the oil pressure changes associated with oil pump control state changes. If the passive test determines that the oil pressure change was less then desired then the intrusive test is retriggered.	Fail from a passing state: Oil Pressure delta is less than a minimum delta pressure on a state change and the measured filtered oil pressure is below a threshold	Oil Pressure delta = ABS [Filtered Oil Pressure at beginning of state change - filtered oil pressure after 1.7 seconds] Oil Pressure delta < **P06DD_P06DE_OP_StateChangeMin** (see P06DE details on Supporting Tables Tab) Filtered Oil Pressure ≤ **P0521_P06DD_P06DE_OP_HiStatePressu(re** - **P06DD_P06DE_OP_LoStatePressure** **) ÷ 2** (see P06DE details on Supporting Tables Tab)	Common Criteria: Two Stage Oil Pump is Present Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 10,000 RPM for longer than 30.0 seconds) No active DTC's for diagnsotic enable: Check oil pump TFTKO as a diagnostic enable when Enabled. No active DTC's for control enable: Active Criteria: One Sided Performance	TRUE ≥ 30.0 seconds ≥ 70.0 kPa FALSE Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA Enabled : OilPmpTFTKO Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA Enabled	≥ 12 errors out of 15 samples. Run once per trip or activiated by the Passive Test	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Test = Disabled			
					Oil Pump in Low State	> 1.7 seconds		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Filtered Engine Speed within range	1,400 RPM ≤ Filtered Engine Speed ≤ 2,500 RPM		
					Engine Torque within range	**P06DD_P06DE_MinEnableTorque_OP** ≤ Indicated Requested Engine Torque ≤ **P06DD_P06DE_MaxEnableTorque_OP** (see P06DE details on Supporting Tables Tab)		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 30 RPM		
					Filtered Oil Pressure within range	Filtered Engine Oil Pressure > **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab)		
					Expected Oil Pressure Delta within range	150.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 350.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					<u>Passive Criteria:</u>			
					Active Test Passed	TRUE		
					Filtered Engine Speed within range	1,400 RPM ≤ Filtered Engine Speed ≤ 4,000 RPM		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.00 seconds] ≤ 1,000 RPM		
					Oil Pressure Delta < **P06DD_P06DE_OP_StateChangeMin** (see P06DE details on Supporting Tables Tab)	TRUE		
			<u>Fast Pass Condition</u> Oil Pressure delta is less than a minimum delta pressure on a state change and the measured filtered oil pressure is below a threshold	Oil Pressure delta = ABS [Filtered Oil Pressure at beginning of state change - filtered oil pressure after 1.7 seconds] Oil Pressure delta <	<u>Common Criteria:</u> Two Stage Oil Pump is Present Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed	TRUE ≥ 30.0 seconds ≥ 70.0 kPa FALSE	0 errors out of 5 samples. Run once per trip or activiated by the Passive Test	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				P06DD_P06DE_OP_StateChangeMin (P06DD Performance Test Details on Supporting Tables Tab) Filtered Oil Pressure ≤ **P0521_P06DD_P06DE_OP_HiStatePressu** (**re** - **P06DD_P06DE_OP_LoStatePressure**) / 2 (P06DD Performance Test Details on Supporting Tables Tab)	> 10,000 RPM for longer than 30.0 seconds) No active DTC's for diagnsotic enable: Check oil pump TFTKO as a diagnostic enable when Enabled. No active DTC's for control : <u>Active Criteria:</u> One Sided Performance Test = Disabled Oil Pump in Low State Modelled Oil Temperature within range Filtered Engine Speed within range Engine Torque within range	Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA Enabled : OilPmpTFTKO Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA Enabled > 1.7 seconds 40.0 deg C ≤ Oil Temp ≤ 110.0 deg C 1,400 RPM ≤ Filtered Engine Speed ≤ 2,500 RPM **P06DD_P06DE_MinEnableTorque_OP** ≤		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Indicated Requested Engine Torque ≤ **P06DD_P06DE_MaxEnableTorque_OP** (P06DD Performance Test Details on Supporting Tables Tab)		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 30 RPM		
					Filtered Oil Pressure within range	Filtered Engine Oil Pressure > **P06DD_P06DE_MinOilPressThresh** (see P06DD details on Supporting Tables Tab)		
					Expected Oil Pressure Delta within range	150.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 350.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Inlet Airflow System Performance (twin turbo)	P1101	Detects a performance failure in the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor, Throttle Position sensor (TPS), Mass Air Flow (MAF) sensor or MAF B sensor that cannot be uniquely identified as a failure in one individual sensor. This diagnostic can set when more than one of these sensors has a performance concern. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from these five sensors. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when either MAF1 model fails or MAF2 model fails. MAF1 model fails when ABS(Measured MAF1 Flow – Modeled MAF1 Flow) Filtered MAF2 model fails when ABS(Measured MAF2 Flow – Modeled MAF2 Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered	> 20.0 grams/sec > 20.0 grams/sec > 25.0 kPa > 25.0 kPa > 25.0 kPa > 30.0 kPa	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables. -	>= 400 RPM <= 6,500 RPM >= -7 Deg C = TRUE) <= 150 Deg C >= -20 Deg C <= 125 Deg C >= 0.50 Modeled MAF1 Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** Modeled MAF2 Error multiplied by **P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on MAF Est** and	Continuous Calculation are performed every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		performance issue with the system, but no single failed sensor can uniquely be identified. In this case, the Inlet Airflow System Performance diagnostic will fail.	TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is	> 225 kPa*(g/s) > 30.0 kPa > 30.0 kPa > 1.5 seconds > 1.5 seconds	No Active DTCs: -	**P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on RPM** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			TRUE when Mass Air Flow AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure -	> a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 2.0 gm/sec < a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table	No Pending DTCs:	EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Lane Center Switch Circuit	P1589	Detects failure for cruise lane centering control circuit	Lane Center Control switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 20.00 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 20.00 seconds	Type C, No MIL , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Imbalance	P16E7	This DTC indicates that work between the two turbos in the Twin Turbo system (parallel Turbos) is not balanced. This diagnose is enabled when boost pressure control is active.	Absolut value of (VeBSTR_Pct_TwinBalance = WastegateControl A - WastegateControl B)	> 15.00 %	Diagnostic enabled ***************************** Engine speed ***************************** No DTCs active: ***************************** No boost pressure control failsoft mode active: (VeBSTR_e_FsftAction) ***************************** Boost pressure closed loop control is active.	True ***************************** <= 6,800 rpm ***************************** MAF_SensorFA ***************************** =CeBSTR_e_NoFsftAction *****************************	18 Failed tests out of 25 tests 100ms/ sample	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Performance (twin turbo)	P2227	Detects a performance failure in the Barometric Pressure (BARO) sensor, such as when a BARO value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The BARO sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the BARO performance diagnostic will fail. If the BARO sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure, BARO and BARO B are compared to see if their values are similar. If the MAP, Turbocharger Boost Pressure and BARO B sensor values are similar, but the BARO value is not similar, then a BARO performance diagnostic will fail.	**<u>Engine Running:</u>** Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update OR Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update	 > 20.0 kPa <= 1.24 miles > 25.0 kPa > 1.24 miles	No Active DTCs:	AmbPresSnsrCktFA IAT_SensorFA MAF_Snsr1_FA AfterThrottlePressureFA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA TC_BoostPresSnsrFA	320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 trips
			<u>Engine Not Rotating:</u> Barometric Pressure OR Barometric Pressure OR ABS(Manifold Pressure - Turbocharger Boost Pressure) AND ABS(Manifold Pressure - Baro Pressure) AND ABS(Manifold Pressure - Baro Pressure B) AND ABS(Turbocharger Boost Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure B) AND ABS(Baro Pressure -	 < 50.0 kPa > 115.0 kPa <= 10.0 kPa > 10.0 kPa <= 10.0 kPa > 10.0 kPa <= 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	 > 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP3_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP3_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		When the engine is running, there is an estimate of barometric pressure that is determined with the Turbocharger Boost Pressure sensor, engine air flow and engine speed. If the BARO value from the sensor is not similar to this barometric pressure estimate, then the BARO performance diagnostic will fail.	Baro Pressure B)	> 10.0 kPa				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor B Circuit Range/ Performance	P222B	Detects a performance failure in the Barometric Pressure (BARO) B sensor, such as when a BARO B value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The BARO B sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the BARO B performance diagnostic will fail. If the BARO B sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure, BARO and BARO B are compared to see if their values are similar. If the MAP, Turbocharger Boost Pressure and BARO sensor values are similar, but the BARO B value is not similar, then a BARO B performance diagnostic will fail.	**Engine Running:** Difference between Baro Pressure B reading and Estimated Baro when distance since last Estimated Baro update OR Difference between Baro Pressure B reading and Estimated Baro when distance since last Estimated Baro update	> 20.0 kPa <= 1.24 miles > 25.0 kPa > 1.24 miles	No Active DTCs:	AmbPresSnsr2_CktFA IAT_SensorFA MAF_Snsr2_FA AfterThrottlePressureFA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA TC_BoostPresSnsrFA	320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 trips
			Engine Not Rotating: Barometric Pressure B OR Barometric Pressure B OR ABS(Manifold Pressure - Turbocharger Boost Pressure) AND ABS(Manifold Pressure - Baro Pressure) AND ABS(Manifold Pressure - Baro Pressure B) AND ABS(Turbocharger Boost Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure B) AND ABS(Baro Pressure -	< 50.0 kPa > 115.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP3_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP3_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		When the engine is running, there is an estimate of barometric pressure that is determined with the Turbocharger Boost Pressure sensor, engine air flow and engine speed. If the BARO B value from the sensor is not similar to this barometric pressure estimate, then the BARO B performance diagnostic will fail.	Baro Pressure B)					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor B Circuit Low (Gen III)	P222C	Detects a continuous short to ground in the Barometric Pressure (BARO) B signal circuit by monitoring the BARO B sensor output voltage and failing the diagnostic when the BARO B voltage is too low. The BARO B sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	BARO B Voltage	< 40.0 % of 5 Volt Range (This is equal to 50.9 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor B Circuit High (Gen III)	P222D	Detects a continuous short to power or open circuit in the Barometric Pressure (BARO) B signal circuit by monitoring the BARO B sensor output voltage and failing the diagnostic when the BARO B voltage is too high. The BARO B sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	BARO B Voltage	> 90.0 % of 5 Volt Range (This is equal to 115.0 kPa)			320 failures out of 400 samples 1 sample every 12.5 msec	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor B Circuit Intermittent/ Erratic	P222E	Detects a noisy or erratic signal in the barometric pressure (BARO) B circuit by monitoring the BARO B sensor and failing the diagnostic when the BARO B signal has a noisier output than is expected. When the value of BARO B in kilopascals (kPa) is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of BARO B readings. The result of this summation is called a “string length”. Since the BARO B signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic BARO B signal. The diagnostic will fail if the string length is too high.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current BARO B reading - BARO B reading from 12.5 milliseconds previous)	> 100 kPa 80 consecutive BARO B readings			4 failures out of 5 samples Each sample takes 1.0 seconds	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Performance Bank 1 (For use with WRAF - E81	P223C	This DTC determines if the WRAF O2 sensor pumping current has an incorrect or out of range value. This DTC will detect open circuit faults to the Pump current, Ref Cell voltage, Ref Ground circuits. When enabled, the diagnostic monitors the pumping current in three different fault regions during DFCO. The individual diagnostic failure counters are incremented based on the diagnostic results in each region. The DTC is set based on any of the three individual fail and sample counters.	Fault condition present when the pump current is in any of the fault regions when this test is enabled during DFCO. Note: This ASIC is referred to as ATIC142 (Continental).	The three pump current fault regions are: A) Pump current > 5.00 ma B) Pump current ≤ 0.30 ma and ≥ - 0.30 ma C) Pump current < -0.10 ma The three fault regions have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) ************************** WRAF Ref cell temperature Test starts when time in DFCO Test stops when time in DFCO	P0135, P0030, P0031 or P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds ≥ 628 Deg C ≥ 5.0 seconds > 12.0 seconds	Region A: 40 failures out of 160 samples OR Region B: 40 failures out of 160 samples OR Region C: 40 failures out of 160 samples Sample rate is 25 msec. Test enabled during DFCO.	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Performance Bank 2 (For use with WRAF - E81	P223D	This DTC determines if the WRAF O2 sensor pumping current has an incorrect or out of range value. This DTC will detect open circuit faults to the Pump current, Ref Cell voltage, Ref Ground circuits. When enabled, the diagnostic monitors the pumping current in three different fault regions during DFCO. The individual diagnostic failure counters are incremented based on the diagnostic results in each region. The DTC is set based on any of the three individual fail and sample counters.	Fault condition present when the pump current is in any of the fault regions when this test is enabled during DFCO. Note: This ASIC is referred to as ATIC142 (Continental).	The three pump current fault regions are: A) Pump current > 5.00 ma B) Pump current ≤ 0.30 ma and ≥ - 0.30 ma C) Pump current < -0.10 ma The three fault regions have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B2S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) ************************** WRAF Ref cell temperature Test starts when time in DFCO Test stops when time in DFCO	P0155, P0050, P0051 or P0052 = Valid = Ready = True = Complete ≥ 20.0 seconds ≥ 628 Deg C ≥ 5.0 seconds > 12.0 seconds	Region A: 40 failures out of 160 samples OR Region B: 40 failures out of 160 samples OR Region C: 40 failures out of 160 samples Sample rate is 25 msec. Test enabled during DFCO.	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Reference Resistance Out Of Range Bank 2	P223F	This DTC determines if the WRAF O2 sensor reference cell has an incorrect or out of range resistance value. This test compares the element's resistance (from the WRAF sensor Application-Specific Integrated Circuit (ASIC)) to the expected values for the enabled condition. The element temperature is directly related to the element resistance based on the released sensor element specifications. The diagnostic failure counter is incremented if the element temperature is outside the expected range. This DTC is set based on the fail and sample counters.	Measured Reference cell temperature	< 700 Deg C OR > 1,000.0 Deg C	B2S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) Then Delay after WRAF circuit diagnostic delay **************************	P0155, P0050, P0051 or P0052 = Valid = Ready = True = Complete ≥ 20.0 seconds ≥ 0.0 seconds	64 failures out of 80 samples Sample rate is 25 msec Continuous	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1 (For use with WRAF - E81	P2626	This DTC determines if the WRAF O2S trim circuit is open. The trim circuit fine tunes the WRAF O2S pump current signal. The diagnostic is an Application-Specific Integrated Circuit (ASIC) intrusive test which runs when the Run/Crank signal changes from False to True. The diagnostic failure counter is incremented if the ASIC test fails and the enable conditions are met. This DTC is set based on the fail and sample counters.	B1S1 Trim circuit Open test. This application uses the following type of WRAF sensor: The ASIC Open trim test detects a fault if the trim circuit resistance is: For NGK_ZFAS_U2 For Bosch_LSU_4p9 Note: This ASIC is referred to as ATIC142 (Continental).	CeWRSG_e_NGK_ZFAS_U2 > 4,644 ohms > 379.5 ohms	Run/Crank Signal WRAF circuit diagnostic delay (since heater Warm-up delay is complete) Fuel Control State Off Stoich Closed Loop DFCO WRAF Pump current	changes from false to true ≥ 20.0 seconds = Closed Loop = Not active = Not active ≤ 0.3 ma	128 fail counts out of 160 samples 25 ms / sample Continuous	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Trim Circuit/Open Bank 2 Sensor 1 (For use with WRAF - E81	P2629	This DTC determines if the WRAF O2S trim circuit is open. The trim circuit fine tunes the WRAF O2S pump current signal. The diagnostic is an Application-Specific Integrated Circuit (ASIC) intrusive test which runs when the Run/Crank signal changes from False to True. The diagnostic failure counter is incremented if the ASIC test fails and the enable conditions are met. This DTC is set based on the fail and sample counters.	B2S1 Trim circuit Open test. This application uses the following type of WRAF sensor: The ASIC Open trim test detects a fault if the trim circuit resistance is: For NGK_ZFAS_U2 For Bosch_LSU_4p9 Note: This ASIC is referred to as ATIC142 (Continental).	CeWRSG_e_NGK_ZFAS_U2 > 4,644 ohms > 379.5 ohms	Run/Crank Signal WRAF circuit diagnostic delay (since heater Warm-up delay is complete) Fuel Control State Off Stoich Closed Loop DFCO WRAF Pump current	changes from false to true ≥ 20.0 seconds = Closed Loop = Not active = Not active ≤ 0.3 ma	128 fail counts out of 160 samples 25 ms / sample Continuous	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Shared High Side Drive #2 Control Circuit Low (STG) - (GEN III Controllers ONLY)	P2670	Controller specific output driver circuit diagnoses the shared high sided driver # 2 for a short to ground failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	- Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. - Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 0.5 Ω impedance between signal and controller ground	Shared high side drive #2 low diag enable Powertrain relay voltage Run Crank voltage Powertrain relay state	= 1 >= 11.00 > 5.00 = ON	20 failures out of 25 samples 100 ms / sample	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Shared High Side Drive #2 Control Circuit High (STP) - (GEN III Controllers ONLY)	P2671	Controller specific output driver circuit diagnoses the shared high sided driver # 2 for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	- Voltage measurement outside of controller specific acceptable range during driver off state indicates short to power failure. - Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedance between signal and controller power	Shared high side drive #2 diag enable Powertrain relay voltage Run Crank voltage Powertrain relay state	= 1 >= 11.00 > 5.00 = ON	20 failures out of 25 samples 100 ms / sample	Type B, 2 trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Transfer Case Control Module	U0102	This DTC monitors for a loss of communication with the transfer case control module	Message is not received from controller for Message $1CB Message $1CC	 ≥ 10.0 seconds ≥ 10.0 seconds	General Enable Criteria: U0073 Normal CAN transmission on Bus A Device Control High Voltage Virtual Network Management Ignition Voltage Criteria: Run/Crank Ignition voltage Power Mode Off Cycle Enable Criteria: KeCAND_b_OffKeyCycleDiagEnbl Ignition Accessory Line and Battery Voltage General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is	 Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 1 (1 indicates enabled) = Active > 11.00 Volts	Diagnostic runs in 12.5 ms loop	Type C, No MIL "Special Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for	> 0.4000 seconds		
					U0102	Not Active on Current Key Cycle		
					TCCM	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Front Object Detection Control Module	U216A	This DTC monitors for a loss of communication with the Front Object Detection Control Module.	Messages are not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type C, No MIL
					U0073	Not Active on Current Key Cycle		
			Message $2CB	≥ 10.0 seconds	Normal CAN transmission on Bus A	Enabled		
			Message $2CD	≥ 10.0 seconds	Device Control	Not Active		
			Message $2CF	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $370	≥ 10.0 seconds				
					Ignition Voltage Criteria:			
					Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line	= Active		
					and Battery Voltage	> 11.00 Volts		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 5.0000 seconds Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					U216A	Not Active on Current Key Cycle		
					EOCM, FCM, or RDCM modules (Front Object Detection Modules)	are present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 2 Relay Control Circuit Open (ODM)	P0481	Diagnoses the cooling fan 2 relay control low side driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: ≥ 200 K Ω impedance between signal and controller ground	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50 failures out of 63 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P0693 may also set (Fan 2 Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Current Monitoring Performance	P058B	Determines that the Battery Monitor Module Current Monitoring is functioning properly by comparing it to a reference current sensor directly connected to, and measured by ECM.	The absolute value of the difference between the Battery Monitor Module current and the ECM measured reference current is greater than threshold value.	>= 22.00 Amp	Diagnostic Enabled	TRUE	160.00 failures out of 200.00 samples	Type B, 2 Trips
					P118C	Not FA or TFTKO		
					P118D	Not FA or TFTKO	25 ms/sample continuous	
					Run/Crank or Accessory	TRUE		
					Hybrid Starter Status	<> Engine Starting or Engine Stopping for 40.00 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Voltage Monitoring Performance	P058D	Determines that the Battery Monitor Module Voltage Monitoring is functioning properly by comparing it to a reference battery voltage directly measured by ECM.	The absolute value of the difference between the Battery Monitor Module voltage and the ECM measured reference voltage is greater than threshold value.	>= 2.00 Volt	Diagnostic Enabled PT Relay Run/Crank or Accessory Hybrid Starter Status	TRUE Not FA or TFTKO TRUE <> Engine Starting or Engine Stopping for 40.00 counts	160.00 failures out of 200.00 samples 25 ms/sample continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 2 Relay Control Circuit Low Voltage (ODM)	P0693	Diagnoses cooling fan 2 relay control low side driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50 failures out of 63 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P0481 may also set (Fan 2 Open Circuit).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 2 Relay Control Circuit High Voltage (ODM)	P0694	Diagnoses the cooling fan 2 relay control low side driver circuit for circuit faults	Voltage high during driver on state (indicates short to power)	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50 failures out of 63 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Current Sensor A Circuit Low	P118C	Detects a continuous short to ground or open in the Battery Current Sensor A signal.	Battery Current Sensor A is less than threshold.	-400.00 Amp	Diagnostic Enabled Run/Crank or Accessory	TRUE TRUE	160.00 failures out of 200.00 samples 25 ms/sample continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Current Sensor A Circuit High	P118D	Detects a continuous short to power in the Battery Current Sensor A signal.	Battery Current Sensor A is greater than threshold.	150.00 Amp	Diagnostic Enabled	TRUE	160.00 failures out of 200.00 samples	Type B, 2 Trips
					Run/Crank or Accessory	TRUE		
							25 ms/sample continuous	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Dual Battery Control Module Performance	P305F	Determines that the Dual Battery Control Module is functioning properly by detecting whether the battery voltage, as directly measured by ECM, fell below a threshold for n consecutive auto-start events, where each auto-start event had the threshold exceeded for m number of samples.	ECM measured battery voltage is less than threshold for present auto-start event.	8.90 Volt	Diagnostic Enabled Hybrid Starter Status	TRUE = Engine Starting for 0.00 counts	5.00 failures out of 10.00 samples taken during auto-start event. 6.25 ms/sample	Type A, 1 Trips
			Exceeded consecutive number of auto-start events where Present Auto-Start Event malfunction criteria was met.	2.00 auto-start events	Diagnostic Enabled	TRUE	2.00 auto-start events out of 3.00	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Active Grill Air Shutter B Performance /Stuck OFF	P05AE	A 2-part diagnostic. Part 1 continuously monitors for failure to achieve a commanded shutter actuator position [Suspect Stuck Condition] when X failures occur in Y samples after an electronic command latency delay. Part 1 failure enables Part 2 which makes a fixed number of repeat attempts to reach the commanded position [ReTry to clear obstruction]. The DTC is set when the calibrated fault threshold count of repeat attempts is reached without achieving the original commanded shutter position.	Smart Shutter Actuator 2 Position Response AND Shutter 2 Diagnostic Delay Threshold count	<> Smart Shutter Actuator 2 Commanded Position percent AND Counter > 109.00 counts	a. Ignition Run_Crank Active, b. Ignition Run_Crank AND Ignition Accessory AND ECU Awake, c. Command Shutter2 Enable	a. = TRUE, b. = FALSE AND = FALSE AND = TRUE, c. = 1.00	1.00 failures out of 1.00 samples 1 sample / 100 milliseconds	Type B, 2 Trips
			Shutter 2 Performance Test count	= 5.00 counts	a. Ignition Run_Crank Active, b. Ignition Run_Crank AND Ignition Accessory AND ECU Awake, c. Command Shutter2 Enable	a. = TRUE, b. = FALSE AND = FALSE AND = TRUE, c. = 1.00	1-5 actuator cycles [1 cycle typically requires 10-25 seconds]	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Communication Error with Active Grill Air Shutter Module “B”	P151F	This DTC monitors for an internal error or error in communication with the Active Grill Air Shutter Module B	Communication of the Alive Rolling Count from the Shutter Module over LIN bus is incorrect or the Shutter Module signals it has an internal error for out of total samples	>= 10.00 counts >= 10.00 counts	All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	>= 3.00 seconds = Run >= 11.00 Volts >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
LIN Bus 1 Lost Communication with Device 1 (Shutter 2)	U1511	This DTC monitors for a loss of communication on the LIN bus with Shutter 2	ECM has lost communication over the LIN bus with Device 1 / Shutter 2 for	>= 3.00 counts	The following criteria have been enabled for Power Mode Run/Crank Voltage	>= 400.00 milliseconds =Run >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type B, 2 Trips

Conditions for Estimated Ambient Temperature Using OAT Sensor to be Valid
****
1. Startup OAT is less than previous trip EAT
OR

2. Startup ECT - previous trip EAT ≤ 0 °C

OR
3. Engine off time ≥ 7,200 seconds
OR
4. At startup, time since previous EAT valid and able to learn ≤ 3,600 seconds
OR
5. EAT - current OAT 0 °C ≤ difference ≤ 2 °C
OR
6. EAT < current OAT
and speed timer ≥ 260 seconds
and current OAT - EAT ≤ 2 °C
Speed timer increments at 100 msec rate and increments vary based on vehicle speed as follows:
vehicle speed < 14 mph -0.2 seconds
14 mph<speed< 43 mph 0.12 seconds
43 mph<speed< 99 0.23 seconds
99 mph<speed< 124 0.23 seconds

Speed timer can never be less than 0 seconds

**** Closed Loop Fuel Control Enable Criteria ****

Engine run time greater than
Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopAutostart

(HYBRID ONLY)
X axis: AutoStart Coolant
Y axis: Close Loop Enable Time
and
Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopTime

X axis: Start-Up Coolant
Y axis: Close Loop Enable Time
and
[
Pre converter 02 sensor voltage less than
(
Closed Loop Enable Clarification - KfFULC_U_O2_SensorReadyThrshLo

(Switching Sensor)

Voltage < XXXX milliVolts
or
Closed Loop Enable Clarification - KeEOSD_U_RichThrsh
(Switching Sensor)
Voltage < XXXX milliVolts

)
for
Closed Loop Enable Clarification - KcFULC_O2_SensorReadyEvents

(Switching Sensor)

Time (events * 12.5 milliseconds) > XXXX events
or
WRAF heater temperature greater than
(
Closed Loop Enable Clarification - KeWRSC_T_HtrCntrlCL

(WRAF Sensor)
and
Closed Loop Enable Clarification - KeWRSI_T_PumpCurrentEnable
(WRAF Sensor)
)
]

and

COSC (Converter Oxygen Storage Control) not enabled

and

Consumed AirFuel Ratio is stoichiometry i.e. not in component protection

and

POPD or Catalyst Diagnostic not intrusive

and

Turbo Scavenging Mode not enabled

and

All cylinders whose valves are active also have their injectors enabled

and
(
O2S_Bank_ 1_TFTKO and
O2S_Bank_ 2_TFTKO and
FuelInjectorCircuit_FA and
FuelInjectorCircuit_TFTKO = False
)

**** Primary Long Term Fuel Trim Enable Criteria ****

Closed Loop Enable and

Coolant greater than
Closed Loop Enable Clarification - KfFCLL_T_AdaptiveLoCoolant

Coolant > XXXX Celcius

or less than
Closed Loop Enable Clarification - KfFCLL_T_AdaptiveHiCoolant

Coolant < XXXX Celcius

and
MAP greater than
Closed Loop Enable Clarification - KtFCLL_p_AdaptiveLowMAP_Limit

Manifold Pressure > XXXX KPa

X axis: Barometric Pressure
Y axis: Manifold Air Pressure
and
TPS_ThrottleAuthorityDefaulted = False

and

Flex Fuel Estimate Algorithm is not active

and

Excessive fuel vapors boiling off from the engine oil algorithm (BOFR) is not enabled

and

Catalyst or EVAP large leak test not intrusive

**** Secondary Fuel Trim Enable Criteria ****

Closed Loop Enable and Post converter O2 voltage less than
Closed Loop Enable Clarification - KfFCLP_U_O2ReadyThrshLo

Voltage < XXXX milliVolts

for
Closed Loop Enable Clarification - KcFCLP_Cnt_O2RdyCyclesThrsh

Time (events * 12.5 milliseconds) > XXXX events

**** Long Term Secondary Fuel Trim Enable Criteria ****

Closed Loop Enable Clarification - KtFCLP_t_PostIntglDisableTime

X axis: Start-Up Coolant
Y axis: Post Integral Enable Time
Plus
Closed Loop Enable Clarification - KtFCLP_t_PostIntglRampInTime

X axis: Start-Up Coolant
Y axis: Post Integral Ramp In Time
and
Modeled Catalyst Temperature < XXXX Celcius
Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMax

and
Modeled Catalyst Temperature > XXXX Celcius

Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMin

and
(PO2S_Bank_1_Snsr_2_FA and
PO2S_Bank_2_Snsr_2_FA = False)

and
Modeled catalytic converter sulfur percent < XXXX Percent
Closed Loop Enable Clarification - KeFCLP_Pct_CatAccuSlphrPostDsbl
and
Post Integral Learn < **Closed Loop Enable Clarification - KaFCLP_U_SlphrIntglOfst_Thrsh**
X axis: Post O2 Sensor Bank
Y axis: Post O2 Mode Cell
Z: Post Integral threshold
and
Airflow < **Closed Loop Enable Clarification - KeFCLP_dm_IntegrationAirflowMax**

OBD Coolant enable
Starting in 11.15A software GM has created a coordinated signal within the ECM that serves as a master enable for diagnostics/controls that use coolant as an enable condition. Controls and diagnostics may choose to enable prior to this calculated signal, but calibrating beyond the OBD limit will not function because of this signal. This enable condition is also put on the CAN bus for other modules to consume as well.

KeTHMG_b_elecstatequipd = 0 for this application

For mechanical thermostat applications (KeTHMG_b_elecstatequipd = 0)
OBD Coolant Enable Temp = P0128 Primary target temp – Calibratable offset (0-32) – 1
OBD Coolant Enable Temp = 84 - 0.0 – 1
OBD Coolant Enable Temp = 83.0

For E-stat applications (KeTHMG_b_elecstatequipd = 1)

OBD Coolant Enable Temp = Max(Min(ECT Control Temp) – Primary Warm up delta, Min primary P0128 target) – Calibratable offset (0-32) – 1
OBD Coolant Enable Temp = Max(Min(KaTHMC_T_TMS_EngCoolReq) - KaECTR_T_CTR_WrmUpDeltaTemp[0], KaECTR_T_CTR_WrmUpTargetMin[0]) - KeECTR_T_CTR_GlblMinOffst – 1
OBD Coolant Enable Temp = Max(90.5 - 11 , 84) - 0.0 – 1
OBD Coolant Enable Temp = 83.0

MEMR FNA Matched Flag

GM software maintains a flag that indicates when an ECU has been programmed. When the controller is powered on, the logic compares the application software and calibration data file part numbers and design level suffixes (DLS) that are programmed into ECU flash memory to the part number and DLS data stored in ECU non-volatile memory. If any difference in the part number or DLS values are found, the MEMR_FNA_Matched flag is set to FALSE, otherwise the flag is set to TRUE.

DFCO Enable Conditions
COOLANT ENABLE CRITERIA
Coolant temperature < **DFCO_CoolEnblHi_Temp** °C See Supporting Table
RUN TIME ENEBALE CRIETRIA
Engine run time > **DFCO_DelayAfterStart_Time** seconds See Supporting Table
ENGINE SPEED ENABLE CRITERIA
TORQUE CONVERETR CLUTCH UNLOCK
POPD OFF:
i) enabled when engine speed > (1,900.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (1,500.0 + supporting table value **DFCO_EngSpdEnblOfst**)
POPD ON:
i) enabled when engine speed > (1,900.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (1,500.0 + supporting table value **DFCO_EngSpdEnblOfst**)
TORQUE CONVERETR CLUTCH LOCK
POPD OFF:
i) enabled when engine speed > (1,100.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (900.0 + supporting table value **DFCO_EngSpdEnblOfst**)
POPD ON:
i) enabled when engine speed > (1,100.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (900.0 + supporting table value **DFCO_EngSpdEnblOfst**)
VEHICLE SPEED CRITERIA:
i) enabled when vehicle speed >= (**DFCO_EnblHi_Vehicle_Speed**)
ii) once enabled continue to be enabled until vehicle speed < **DFCO_DsblLo_Vehicle_Speed**
TORQUE CRITERIA :
I) enabled when following AND conditions satisfied
(a) driver raw trq delta = raw toqrue - zero pedal torque <= 65,535.0
b) driver shaped trq delta1 = shaped immediate torque - zero pedal torque <= 5.0
c) driver shaped trq delta2 = shaped predicted torque - minimum combustion unmanaged torque = 65,535.0
d) driver shaped trq delta3 = shaped immediate torque - minimum combustion managed torque <= 65,535.0
ii) once enabled, disabled when following OR conditions are satisfied
a) driver raw trq delta1 = raw torque - zero pedal torque > 60.0
b) driver shaped trq delta2 = zero pedal torque - minimum combustion managed torque > 65,535.0
CATALYST TEMPERATURE
i) enabled based on following AND criteria
a) (CatTemp < 1,800.0 °C and vehicle speed < 0.0 kph)
b) CatTemp < 2,000.0 °C
c) CatalystWarmupEnabled = FALSE

ii) once enabled, disabled when following OR conditions are met

OTHER CONDITIONS:

a) Transmission is not about to unlock

b) Engine not about to stall

c) Transmission is not shifting if already not in DFCO

d) POPD or EOSD

1) POPD requesting DFCO or neither requesting DFCO OFF nor inhibit DFCO

2) EOSD not active

e) EVAP does not inhibit DFCO

f) O2 response test is not inhibiting DFCO event

g) Throttle is not in default mode

****
****

Exhaust Cam Phsr Enable

Exhaust Cam Phsr Enable = TRUE if:

DTCs not set:
CrankSensor_TFTKO
CamSnsrExhTFTKO
CamLctnExhFA

AND

CamSensorAnyLocationFAdiagnostic has executed and passed

AND

Cam edge locations have been learned

AND

[**Intake Cam Phsr Enable** = TRUE
OR
Intake Park Position is Retarded (FALSE)]

AND

[Catalyst Warmup Enabled = TRUE
AND
Engine RPM > 900.00
AND
Engine Run Time > **P0011_P0021_P05CC_P05CD_P0014_P0024_P05CE_P05CF_ColdStartEngRunning** sec]

OR

[Engine is running and engine power is requested

AND
ExhEngineSpeed is Enabled (see below)
AND
ExhOilPressure is Enabled (see below)
AND
ExhEngineOilTemp is Enabled (see below)]

****
ExhEngineSpeed is Enabled when

P0014_P0024_P05CE_P05CF_LoRpmHiEnblEc < Engine RPM <**P0014_P0024_P05CE_P05CF_HiEngSpdLoEnblEc**

ExhEngineSpeed is Disabled when

Engine RPM < **P0014_P0024_P05CE_P05CF_LoRpmLoDsblEc**
OR
Engine RPM > **P0014_P0024_P05CE_P05CF_HiEngSpdHiDsblEc**

****
If an oil pressure sensor is present (TRUE) and is being used (TRUE) then

ExhOilPressureEnable is Enabled when
Oil Pressure > **P0014_P0024_P05CE_P05CF_LoPresHiEnblEc** kPa
for **P0014_P0024_P05CE_P05CF_EngOilPressEnblEc** seconds

ExhOilPressureEnable is Disabled when
Oil pressure < **P0014_P0024_P05CE_P05CF_LoPresLoDsblEc** kPa

If an oil pressure sensor is not present (FALSE) OR is not being used (FALSE) then

ExhOilPressureEnable is Enabled when
Engine RPM > **P0014_P0024_P05CE_P05CF_LoRpmHiEnblEc**
for **P0014_P0024_P05CE_P05CF_EngOilPressEnblEc** seconds

****
ExhEngineOilTemp is Enabled when

-10.00 < Engine Oil Temp < 150.00 deg C

ExhEngineOilTemp is Disabled when
Engine Oil Temp < -13.00 deg C
OR
Engine Oil Temp > 160.00 deg C

****
****

Intake Cam Phsr Enable

Intake Cam Phsr Enable = TRUE if:

DTCs not set:
CrankSensor_TFTKO
CamSnsrIntTFTKO
CamLctnIntFA

AND

CamSensorAnyLocationFA has executed and passed

AND

Cam edge locations have been learned

AND

[Catalyst Warmup Enabled = TRUE
AND
Engine RPM > 900.00
AND
Engine Run Time > **P0011_P0021_P05CC_P05CD_P0014_P0024_P05CE_P05CF_ColdStartEngRunning** sec]

OR

[Engine is running and engine power is requested
AND
IntEngineSpeed is Enabled
AND
IntOilPressure is Enabled
AND
IntEngineOilTemp is Enabled]

****
IntEngineSpeed is Enabled when
P0011_P0021_P05CC_P05CD_LoRpmHiEnbllc < Engine RPM < **P0011_P0021_P05CC_P05CD_HiEngSpdLoEnbllc**

IntEngineSpeed is Disabled when

Engine RPM < **P0011_P0021_P05CC_P05CD_LoRpmLoDsbllc**
OR
Engine RPM > **P0011_P0021_P05CC_P05CD_HiEngSpdHiDsbllc**

****
If an oil pressure sensor is present (TRUE) and is being used (TRUE) then

IntOilPressureEnable is Enabled when
Oil Pressure > **P0011_P0021_P05CC_P05CD_LoPresHiEnbllc** kPa
for **P0011_P0021_P05CC_P05CD_EngOilPressEnbllc** seconds

IntOilPressureEnable is Disabled when
Oil pressure < **P0011_P0021_P05CC_P05CD_LoPresLoDsbllc**

If an oil pressure sensor is not present (FALSE) or is not being used (FALSE) then

IntOilPressureEnable is Enabled when
Engine RPM > **P0011_P0021_P05CC_P05CD_LoRpmHiEnbllc**
for **P0011_P0021_P05CC_P05CD_EngOilPressEnbllc** seconds

****
IntEngineOilTemp is Enabled when

-25.00 < Engine Oil Temp < 150.00 deg C

IntEngineOilTemp is Disabled when
Engine Oil Temp < -27.00 deg C
OR
Engine Oil Temp > 160.00 deg C

****

Low Fuel Condition Diagnostic flag

Flag set to TRUE if the fuel level < 10.0 % AND

No Active DTCs: FuelLevelDataFault, P0462, P0463 for at least 30.0 seconds

Transfer Pump is Commanded On Flag

Fuel Volume in Primary Fuel Tank < 0.0 liters AND

Fuel Volume in Secondary Fuel Tank ≥ 0.0 liters AND

Transfer Pump on Time < P0461, P2066, P2636: Transfer Pump Enable (see supporting table for numeric value) AND

Transfer Pump had been Off for at least 0.0 seconds AND

Evap Diagnostic (Purge Valve Leak Test, Large Leak Test, and Waiting for Purge) is not running AND

Engine Running

Initial Supporting table - Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests

Description: This table describes the adaptive (Block Learn) cells in which to enable the Post (Secondary) Oxygen sensor response tests.
Note: When the table column heading matches the calibration value below it, that individual cell is enabled.

The cell numbers in the table are defined as:
CeFADR_e_Cell00_PurgOnAirMode5 = 0,
CeFADR_e_Cell01_PurgOnAirMode4 = 1,
CeFADR_e_Cell02_PurgOnAirMode3 = 2,
CeFADR_e_Cell03_PurgOnAirMode2 = 3,
CeFADR_e_Cell04_PurgOnAirMode1 = 4,
CeFADR_e_Cell05_PurgOnAirMode0 = 5,
CeFADR_e_Cell06_PurgOnIdle = 6,
CeFADR_e_Cell07_PurgOnDecel = 7,
CeFADR_e_Cell08_PurgOffAirMode5 = 8,
CeFADR_e_Cell09_PurgOffAirMode4 = 9,
CeFADR_e_Cell10_PurgOffAirMode3 = 10,
CeFADR_e_Cell11_PurgOffAirMode2 = 11,
CeFADR_e_Cell12_PurgOffAirMode1 = 12,
CeFADR_e_Cell13_PurgOffAirMode0 = 13,
CeFADR_e_Cell14_PurgOffIdle = 14,
CeFADR_e_Cell15_PurgOffDecel = 15

Value Units: Block Learn cell number
X Unit: Block Learn cell number

y/x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0	7	7	7	7	7	7	7	8	15	15	15	15	15	15	15

Initial Supporting table - Multiple DTC Use_Green Sensor Delay Criteria - Limit

Description: This Calibration is the acculmulated airflow limit above which the Green condition is expired
Used for: P0133, P013A, P013B, P013C, P013D, P013E, P013F, P014A, P014B, P0153, P015A, P015B, P015C, P015D, P1133, P1153, P2270, P2271, P2272 and P2273.
Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.

Value Units: Grams
X Unit: Acculmulated Engine Airflow

y/x	CiOXYR_O2_Bank1_Sensor1	CiOXYR_O2_Bank1_Sensor2	CiOXYR_O2_Bank2_Sensor1	CiOXYR_O2_Bank2_Sensor2
1	120,000	120,000	120,000	120,000

Initial Supporting table - P0011_CamPosErrorLimIc1

Description: Maximum Intake Cam 1 phase error as a function of engine speed and engine oil temperature.

Value Units: Maximum Intake Cam 1 phase error (degCAM)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Initial Supporting table - P0011_P0021_P05CC_P05CD_EngOilPressEnblIc

Description: Delay time before the oil pressure enable flag is set assuming all the oil pressure enable criteria are met

Value Units: Time (sec)
X Unit: Engine Coolant Temperature (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	5	5	5	4	4	4	4	2	1	1	1	1	1	1	3	3	3

Initial Supporting table - P0011_P0021_P05CC_P05CD_HiEngSpdHiDsblIc

Description: Minimum engine speed to disable Intake cam

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000

Initial Supporting table - P0011_P0021_P05CC_P05CD_HiEngSpdLoEnblIc

Description: Maximum engine speed to enable Intake cam - works as hysteresis.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoPresHiEnblIc

Description: Intake cam is enabled when oil pressure exceeds this value

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoPresLoDsblIc

Description: Intake cam is disabled when oil pressure falls below this value

Value Units: Engine Oil Pressure (kPa)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoRpmHiEnblIc

Description: Intake cam is enabled when engine speed exceeds this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoRpmLoDsblIc

Description: Intake cam is disabled when engine speed is below this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950

Initial Supporting table - P0011_P0021_P05CC_P05CD_P0014_P0024_P05CE_P05CF_ColdStartEngRunning

Description: Engine running time must be greater than this threshold during a cold start to enable cam phasing

Value Units: Time (sec)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	30	15	4	4	4	3	3	3	2	1	1	1	1	2	2	2	2

Initial Supporting table - P0011_P05CC_StablePositionTimeIc1

Description: Minimum time for Intake Cam 1 phase position to be stable to enable performance diagnostic.

Value Units: Minimum time (sec)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P0014_CamPosErrorLimEc1

Description: Maximum Exhaust Cam 1 phase error as a function of engine speed and engine oil temperature.

Value Units: Maximum Exhaust Cam 1 phase error (degCAM)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Initial Supporting table - P0014_P0024_P05CE_P05CF_EngOilPressEnblEc

Description: Delay time before the oil pressure enable flag is set assuming all the oil pressure enable criteria are met

Value Units: Time (sec)
X Unit: Engine Coolant Temperature (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2

Initial Supporting table - P0014_P0024_P05CE_P05CF_HiEngSpdHiDsblEc

Description: Exhaust cam is disabled when engine speed exceeds this value

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000

Initial Supporting table - P0014_P0024_P05CE_P05CF_HiEngSpdLoEnblEc

Description: Exhaust cam is enabled when engine speed remains below this value

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoPresHiEnblEc

Description: Exhaust cam is enabled when oil pressure exceeds this value

Value Units: Engine Oil Pressure (kPa)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoPresLoDsblEc

Description: Exhaust cam is disabled when oil pressure falls below this value

Value Units: Engine Oil Pressure (kPa)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoRpmHiEnblEc

Description: Exhaust cam is enabled when engine speed exceeds this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoRpmLoDsblEc

Description: Exhaust cam is disabled when engine speed is below this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800

Initial Supporting table - P0014_P05CE_StablePositionTimeEc1

Description: Minimum time for Exhaust Cam 1 phase position to be stable to enable performance diagnostic.

Value Units: Minimum time (sec)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table -P0021_CamPosErrorLimIc2

Description: Maximum Intake Cam 2 phase error as a function of engine speed and engine oil temperature.

Value Units: Maximum Intake Cam 2 phase error (degCAM)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Initial Supporting table - P0021_P05CD_StablePositionTimeIc2

Description: Minimum time for Intake Cam 2 phase position to be stable to enable performance diagnostic.

Value Units: Minimum time (sec)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P0024_CamPosErrorLimEc2

Description: Maximum Exhaust Cam 2 phase error as a function of engine speed and engine oil temperature.

Value Units: Maximum Exhaust Cam 2 phase error (degCAM)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5,600	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,400	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6,800	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Initial Supporting table - P0024_P05CF_StablePositionTimeEc2

Description: Minimum time for Exhaust Cam 2 phase position to be stable to enable performance diagnostic.

Value Units: Minimum time (sec)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5,600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6,800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P0071: OAT Performance Drive Equilibrium Engine Off

Description: OAT Performance Diagnostic counter increment for determining OAT-IAT equilibrium for engine off (for hybrid applications)

Value Units: Counter Increment Value (Unitless)
X Unit: Vehicle Speed (KPH)

y/x	0.0	5.0	10.0	15.0	20.0	25.0	30.0	50.0	80.0
1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

Initial Supporting table - P0071: OAT Performance Drive Equilibrium Engine Running

Description: OAT Performance Diagnostic counter increment for determining OAT-IAT equilibrium for engine running

Value Units: Counter Increment Value (Unitless)
X Unit: Vehicle Speed (KPH)
Y Units: Engine Air Flow (Grams/Second)

y/x	0.0	5.0	10.0	15.0	20.0	25.0	30.0	50.0	80.0
1.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
5.0	-5.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0
10.0	-4.0	-1.0	0.0	0.0	1.0	2.0	3.0	4.0	5.0
20.0	-2.0	-1.0	0.0	0.0	1.0	2.0	3.0	4.0	5.0
30.0	-1.0	0.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0
40.0	0.0	0.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0
50.0	0.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0
60.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
70.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.834	0.894	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
1	1.000	1.000	0.900	0.900	0.900	0.900	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 TPS Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit

Description: Exit Catalyst Warm-up mode if Engine Run Time is greater than this value. This table is based on percent ethanol (x-axis) and catmon's NormRatio_EWMA value (y-axis). The NormRatio_EWMA value determines the state of the catalyst. Typically, NormRatio_EWMA values below 0.35 (0 is bad and 1 is good) represent catalysts that have degraded. The emission performance of these degraded catalysts can be improved by extending catalyst light off of GetE85R_Pct_FFS_CompAtEngFloat.

y/x	0	25	50	75	100
0.000	20	20	20	20	20
0.125	20	20	20	20	20
0.250	20	20	20	20	20
0.375	20	20	20	20	20
0.500	19	19	19	19	19
0.625	19	19	19	19	19
0.750	19	19	19	19	19
0.875	19	19	19	19	19
1.000	19	19	19	19	19

Initial Supporting table - P1400_ColdStartDiagnosticDelayBasedOnEngineRunTime

Description: Quality weight-based on engine run time. This allows adjustment of the weighting factors at various engine run times in order to prevent the updating of the cumulative quality timer or to change the value of the average qualified residual energy calculation to prevent false Fails of the diagnostic under circumstances inappropriate to update the calculation of the average qualified residual value.

y/x	0	1	2	4	7	10	15	20	30
1	0	0	1	1	1	1	1	1	1

Initial Supporting table - P1400_ColdStartDiagnosticDelayBasedOnEngineRunTimeCalAxis

Description: This is the x-axis for the KtCSED_K_TimeWght calibration table. Refer to the description for KtCSED_K_TimeWght for details.

y/x	1	2	3	4	5	6	7	8	9
1	0	1	2	4	7	10	15	20	30

Initial Supporting table - P1400_EngineSpeedResidual_Table

Description: This 1x17 table of engine exhaust flow values is used to calculate both the desired and the actual engine exhaust flow based on desired and actual engine speed. The desired engine exhaust flow is gathered from the desired engine speed (VeSPDR_n_EngDsrd). The value used for the actual engine exhaust flow is based on the actual engine RPM value.

y/x	100	300	500	700	800	850	880	925	980	1,025	1,050	1,100	1,300	1,500	1,800	2,000	2,200
1	2	4	5	5	5	5	6	9	11	12	12	12	12	12	12	12	18

Initial Supporting table - P1400_SparkResidual_Table

Description: Predicted engine-out energy potential based on either the desired cold start spark advance value or the actual spark advance value. ExhEngyPerUnitMass calibration is used to calculate both desired exhaust energy and actual energy. The desired and actual exhaust energy per unit mass values are used in part to calculate the desired exhaust energy per unit time and actual exhaust energy per unit time. Both desired and actual go into the residual exhaust energy per unit time calculation.

y/x	-20	-16	-12	-8	-4	0	4	8	12
1	1.38	1.38	1.31	1.19	1.00	0.88	0.81	0.69	0.63

Initial Supporting table - P0068_Delta MAF Threshold f(TPS)

Description: Table of delta MAF values as a function of desired throttle position. The output of this table provides a delta MAF that if the measured minus the estimated MAF exceeds, is considered a fail.

y/x	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	100.00
1.00	18.95	19.70	14.20	19.48	14.28	31.40	35.20	56.65	255.00

Initial Supporting table - P0068_Delta MAP Threshold f(TPS)

Description: Table of delta MAP values as a function of desired throttle position. The output of this table provides a delta MAP that if the measured minus the estimated MAP exceeds, is considered a fail.

y/x	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	100.00
1.00	40.13	36.99	20.80	19.78	11.14	22.44	21.73	18.77	255.00

Initial Supporting table -P0068_Maximum MAF f(RPM)

Description: Table of maximum MAF values vs. engine speed. This is the maximum MAF the engine can see under all ambient conditions.

y/x	600.00	1,400.00	2,200.00	3,000.00	3,800.00	4,600.00	5,400.00	6,200.00	7,000.00
1.00	20.00	50.00	80.00	115.00	150.00	176.00	194.00	203.00	210.00

Initial Supporting table - P0068_Maximum MAF f(Volts)

Description: Table of maximum MAF values vs. system voltage. The output of the air meter is clamped to lower values as system voltage drops off.

y/x	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00
1.00	0.00	20.00	60.00	150.00	250.00	300.00	300.00	300.00	300.00

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on MAF Est

Value Units: Weight Factor (Unitless)
X Unit: Estimated Engine Air Flow (Grams/Second)

y/x	0	50	70	73	76	79	82	85	89	95	100	110	120	150	200	280	350
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0128_Maximum Accumulated Energy for Start-up ECT conditions - Alternate

Description: KtECTR_E_CTR_WrmUpEnrgyLimTest1

Value Units: Cooling system energy failure threshold (kJ)
X Unit: Minimum ECT for the key cycle (°C)

y/x	-20	-5	10	30	45	60	75
1	11,356	9,538	7,719	5,900	5,000	4,500	4,500

Initial Supporting table - P0128_Maximum Accumulated Energy for Start-up ECT conditions - Primary

Description: KtECTR_E_CTR_WrmUpEnrgyLimTest0

Value Units: Cooling system energy failure threshold (kJ)
X Unit: Minimum ECT for the key cycle (°C)

y/x	-20	-5	10	30	45	60	75
1	25,434	22,194	18,954	15,714	12,474	10,260	10,260

Initial Supporting table - P0606_Last Seed Timeout f(Loop Time)

Description: The max time for the Last Seed Timeout as a function of operating loop time sequence.

P0606_Last Seed Timeout f(Loop Time) - Part 1

y/x	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq	CePISR_e_40msSeq
1	200.000	200.000	200.000	200.000	200.000	200.000	200.000

P0606_Last Seed Timeout f(Loop Time) - Part 2

y/x	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq	
1	200.000	200.000	500.000	8,191.875	8,191.875	8,191.875	

Initial Supporting table - P0606_PSW Sequence Fail f(Loop Time)

Description: Fail threshold for PSW per operating loop.

P0606_PSW Sequence Fail f(Loop Time) - Part 1

y/x	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq	CePISR_e_40msSeq
1	5	3	5	3	5	3	5

P0606_PSW Sequence Fail f(Loop Time) - Part 2

y/x	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq	
1	5	5	5	3	5	5	

Initial Supporting table - P0606_PSW Sequence Sample f(Loop Time)

Description: Sample threshold for PSW per operating loop.

P0606_PSW Sequence Sample f(Loop Time) - Part 1

y/x	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq	CePISR_e_40msSeq
1	4	4	4	4	4	4	4

P0606_PSW Sequence Sample f(Loop Time) - Part 2

y/x	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq	
1	4	4	4	4	4	4	

Initial Supporting table - P1682_PT Relay Pull-in Run/Crank Voltage f(IAT)

Description: The Run/Crank voltages required to pull in the PT relay as a function of induction air temperature.

Value Units: Run/Crank Voltages required to pull in PT Relay (V)
X Unit: Induction Air Temperature (deg C)

y/x	23.000	85.000	95.000	105.000	125.000
1.000	7.000	8.699	9.000	9.199	10.000

Initial Supporting table - P16F3_Delta MAP Threshold f(Desired Engine Torque)

Description: Engine Sync based and Time based delta pressure threshold above which Torque Security error is reported.

y/x	0.00	50.00	100.00	150.00	200.00	300.00
1.00	11.14	11.14	11.14	11.14	11.14	11.14

Initial Supporting table - P16F3_Delta Spark Threshold f(RPM,APC)

Description: Threshold for determining when the difference between commanded spark and applied spark exceeds the torque security requirement. It is a function of engine rpm and APC.

y/x	500.00	980.74	1,461.48	1,942.23	2,422.97	2,903.71	3,384.45	3,865.20	4,345.94	4,826.68	5,307.42	5,788.16	6,268.91	6,749.65	7,230.39	7,711.13	8,191.88
80.00	125.00	35.81	33.52	30.89	32.09	32.45	30.25	26.19	20.59	19.48	18.94	18.64	18.77	18.89	18.91	18.91	18.91
160.00	125.00	28.31	26.50	25.78	27.39	27.19	24.66	21.67	18.31	17.70	17.44	17.16	16.83	16.52	16.48	16.48	16.48
240.00	125.00	22.63	21.94	22.13	23.83	23.39	20.83	18.55	16.50	15.86	15.41	15.11	15.06	15.00	15.00	15.00	15.00
320.00	125.00	18.47	18.69	19.36	21.08	20.45	17.63	15.91	15.09	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
400.00	125.00	15.61	16.19	16.94	18.88	17.80	15.86	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
480.00	125.00	15.00	15.00	15.06	16.58	15.61	15.19	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
560.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
640.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
720.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
800.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
880.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
960.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,040.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,120.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,200.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,280.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,360.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00

Initial Supporting table - P16F3_Speed Control External Load f(Oil Temp, RPM)

Description: Specifies the external load table for SPDR torque security as a function of engine oil temperature and engine RPM.

y/x	-40.00	-20.00	-10.00	0.00	50.00	90.00
200.00	332.75	332.75	332.75	332.75	332.75	332.75
400.00	332.75	332.75	332.75	332.75	332.75	189.41
600.00	332.75	275.54	287.16	332.75	200.93	96.69
700.00	317.11	251.60	261.45	301.80	185.94	63.34
800.00	285.12	232.19	243.38	277.55	174.75	45.04
900.00	259.63	214.40	228.01	256.36	157.63	35.29
1,000.00	237.32	180.83	209.09	234.66	136.70	32.45
1,100.00	203.18	155.14	178.46	202.51	104.94	29.51
1,300.00	157.18	128.95	136.60	157.07	72.37	20.73
1,500.00	128.34	102.62	110.05	130.66	52.84	8.11
2,000.00	72.51	52.06	44.47	53.25	-0.24	-22.82
2,500.00	58.66	39.40	31.61	40.45	-10.64	-31.95
3,000.00	54.68	35.69	27.63	36.47	-14.62	-34.64
3,500.00	52.20	33.34	25.15	33.98	-17.10	-36.66
4,500.00	47.01	27.89	19.96	28.79	-22.29	-43.35
5,500.00	37.31	17.87	10.26	19.09	-31.99	-55.03
6,500.00	23.63	4.17	-3.42	5.41	-45.67	-68.80

Initial Supporting table - Closed Loop Enable Clarification - KaFCLP_U_SlphrIntglOfst_Thrsh

Description: Integral Offset voltage thresholds (bank and cell specific cals) used with KeFCLP_Pct_CatAccuSlphrPostDsbl to check for sulphur poisoning.

Value Units: millivolts
X Unit: Post Catalyst Number

y/x	CiOXYR_O2_PostCat1	CiOXYR_O2_PostCat2
CiFCLP_Decel	2,048	2,048
CiFCLP_Idle	2,048	2,048
CiFCLP_Cruise	2,048	2,048
CiFCLP_LightAccel	2,048	2,048
CiFCLP_HeavyAccel	2,048	2,048

Initial Supporting table - Closed Loop Enable Clarification - KcFCLP_Cnt_O2RdyCyclesThrsh

Description: Number of times a post oxygen sensor value must be in range before declaring it ready

Value Units: Time (events * 12.5 milliseconds)

y/x	1
1	10

Initial Supporting table - Closed Loop Enable Clarification - KcFULC_O2_SensorReadyEvents

Description: Number of times a pre oxygen sensor value must be in range before declaring it ready

Value Units: Time (events * 12.5 milliseconds)

y/x	1
1	10

Initial Supporting table - Closed Loop Enable Clarification - KeEOSD_U_RichThrsh

Description: The oxygen sensor voltage above which a sensor will be considered failing during a Rich Test.

Value Units: Volts

y/x	1
1	1,050

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_dm_IntegrationAirflowMax

Description: Maximum allowed estimated airflow for post O2 integral terms to be updated.

Value Units: Grams per Second

y/x	1
1	512

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_Pct_CatAccuSlphrPostDsbl

Description: Sulphur percent threshold above which post integral learning is disabled if the threshold criteria KaFCLP_U_SlphrIntglOfst_Thrsh is also met.

Value Units: Percent

y/x	1
1	255

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMax

Description: Maximum allowed estimated catalytic converter temperature for post O2 integral terms to be updated.

Value Units: Celcius

y/x	1
1	900

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMin

Description: Minimum allowed estimated catalytic converter temperature to begin using post O2 integration correction terms. Converter temperature must remain above this threshold to ramp-in the post O2 integration adjustments. Once the ramp-in has started, a converter temperature below this threshold will freeze the ramp-in multiplier. Post O2 integration will not be allowed below this converter temperature

Value Units: Celcius

y/x	1
1	450

Initial Supporting table - Closed Loop Enable Clarification - KeWRSC_T_HtrCntrlCL

Description: WRAF heater temperature enabling threshold for transition from Open Loop to Closed Loop

Value Units: Degrees Celcius

y/x	1
1	628

Initial Supporting table - Closed Loop Enable Clarification - KeWRSI_T_PumpCurrentEnable

Description: WRAF heater temperature threshold for enabling the sensor pump current

Value Units: Degrees Celcius

y/x	1
1	640

Initial Supporting table - Closed Loop Enable Clarification - KfFCLL_T_AdaptiveHiCoolant

Description: LTM learning is inhibited if the engine coolant temperature is above this calibration.

Value Units: Degrees Celcius

y/x	1
1	255

Initial Supporting table - Closed Loop Enable Clarification - KfFCLL_T_AdaptiveLoCoolant

Description: LTM learning is inhibited if the engine coolant temperature is below this calibration.

Value Units: Degrees Celcius

y/x	1
1	40

Initial Supporting table - Closed Loop Enable Clarification - KfFCLP_U_O2ReadyThrshLo

Description: Voltage limit checked against when determining if a post converter oxygen sensor is in range

Value Units: millivolts

y/x	1
1	1,100

Initial Supporting table - Closed Loop Enable Clarification - KfFULC_U_O2_SensorReadyThrshLo

Description: Voltage limit checked against when determining if a pre converter oxygen sensor is in range

Value Units: millivolts

y/x	1
1	1,150

Initial Supporting table - Closed Loop Enable Clarification - KtFCLL_p_AdaptiveLowMAP_Limit

Description: Long term fuel learning is disabled below this MAP limit as a function of barometric pressure.

Value Units: KPa
X Unit: KPa

y/x	65	70	75	80	85	90	95	100	105
1	20.0	20.0	20.0	21.0	23.0	24.0	25.0	25.0	25.0

Initial Supporting table - Closed Loop Enable Clarification - KtFCLP_t_PostIntglDisableTime

Description: Disable integral offset after engine start for this amount of time as a function of start up coolant temperature.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-29	-18	-6	5	16	28	39	50	61	73	84	95	106	118	129	140
1	400.0	400.0	400.0	400.0	400.0	240.0	240.0	240.0	40.0	40.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0

Initial Supporting table - Closed Loop Enable Clarification - KtFCLP_t_PostIntglRampInTime

Description: Time required to ramp integral offset to desired value as a function of start up coolant temperature.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-29	-18	-6	5	16	28	39	50	61	73	84	95	106	118	129	140
1	50.0	50.0	50.0	45.0	40.0	40.0	40.0	40.0	30.0	25.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

Initial Supporting table - Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopAutostart

Description: Engine run time following an autostart, as a function of begin run coolant, which must be exceeded to enable CLOSED LOOP.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	100.0	100.0	100.0	55.0	19.0	18.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Initial Supporting table - Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopTime

Description: Engine run time, as a function of startup coolant temperature, which must be exceeded to enable CLOSED LOOP.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	600.0	600.0	600.0	480.0	380.0	85.0	85.0	75.0	75.0	75.0	10.0	10.0	10.0	25.0	25.0	25.0	25.0

Initial Supporting table - P0442 Volatility Time as a Function of Estimate of Ambient Temperature

Description: EONV volatility time as a function of estimated ambient temperature

Value Units: Volatility time (seconds)
X Unit: Estimated Ambient Temperature (Deg C)

y/x	-10	-4	1	7	13	18	24	29	35	41	46	52	58	63	69	74	80
1	30	30	30	30	60	120	210	325	340	350	500	500	500	500	500	500	500

Initial Supporting table - P0442 Engine Off Time Before Vehicle Off Maximum as a Function of Estimated Ambient Temperature

Description: Maximum engine off time before vehicle off time as a function of estimated ambient temperature (EAT)

Value Units: Maximum Engine Off Time Before Vehicle Off Time (seconds)
X Unit: Estimated Ambient Temperature (Deg C)

y/x	-10	-4	1	7	13	18	24	29	35	41	46	52	58	63	69	74	80
1	70	70	70	70	74	82	105	153	320	480	480	480	480	480	480	480	480

Initial Supporting table - P0442 EONV Pressure Threshold (Pascals)

Description: EONV pressure threshold as a function of fuel level and estimated ambient temperature (EAT)

Value Units: EONV Pressure Threshold (Pascals)
X Unit: Fuel Level (percent) from 0 to 100 with step size 6.25
Y Units: Estimated Ambient Temperature (deg C) from -10 to 80 with step size 5.625

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
2	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
3	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
4	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
5	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
7	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
8	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
9	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
10	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
11	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
12	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
13	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
14	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
15	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
16	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6
17	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6	-535.6

Initial Supporting table - P0496 Purge Valve Leak Test Engine Vacuum Test Time (Cold Start) as a Function of Fuel Level

Description: Purge valve leak test engine vacuum test time as a function of fuel level

Value Units: Purge Valve Leak Test Engine Vacuum Test Time (seconds)
X Unit: Fuel Level (percent)

y/x	0	6	12	19	25	31	37	44	50	56	62	69	75	81	87	94	100
1	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Initial Supporting table - P057B KtBRKI_K_CmpltTestPointWeight

Description:

y/x	0.000	0.030	0.050	0.052	0.060	0.080	0.100	0.750	1.000
1	0	0	0	1	1	1	1	1	1

Initial Supporting table - P057B KtBRKI_K_FastTestPointWeight

Description:

y/x	0.000	0.030	0.050	0.052	0.100	0.450	0.550	0.750	1.000
1	0	0	0	1	1	1	1	1	1

Initial Supporting table - DFCO_CoolEnblHi_Temp

Description:

y/x	-40	0	20
1	25.0	30.0	60.0

Initial Supporting table - DFCO_DelayAfterStart_Time

Description:

y/x	-30	-10	20	60	90
1	30.0	30.0	30.0	15.0	10.0

Initial Supporting table - DFCO_DsblLo_Vehicle_Speed

Description:

y/x	CeTCOR_e_NonEcoMode	CeTCOR_e_EcoMode
CeTGRR_e_TransGr1	25	25
CeTGRR_e_TransGr2	27	27
CeTGRR_e_TransGr3	27	27
CeTGRR_e_TransGr4	29	29
CeTGRR_e_TransGr5	31	31
CeTGRR_e_TransGr6	33	33
CeTGRR_e_TransGr9	512	512
CeTGRR_e_TransGr10	512	512
CeTGRR_e_TransGrNeut	512	512
CeTGRR_e_TransGrRvrs	512	512
CeTGRR_e_TransGrPark	512	512
CeTGRR_e_TransGr7	43	43
CeTGRR_e_TransGr8	53	53

Initial Supporting table - DFCO_EnblHi_Vehicle_Speed

Description:

y/x	CeTCOR_e_NonEcoMode	CeTCOR_e_EcoMode
CeTGRR_e_TransGr1	28.0	28.0
CeTGRR_e_TransGr2	30.0	30.0
CeTGRR_e_TransGr3	30.0	30.0
CeTGRR_e_TransGr4	31.5	31.5
CeTGRR_e_TransGr5	33.0	33.0
CeTGRR_e_TransGr6	36.0	36.0
CeTGRR_e_TransGr9	512.0	512.0
CeTGRR_e_TransGr10	512.0	512.0
CeTGRR_e_TransGrNeut	512.0	512.0
CeTGRR_e_TransGrRvrs	512.0	512.0
CeTGRR_e_TransGrPark	512.0	512.0
CeTGRR_e_TransGr7	46.0	46.0
CeTGRR_e_TransGr8	56.0	56.0

Initial Supporting table - DFCO_EngSpdEnblOfst

Description:

y/x	-1,500	-1,250	-1,000	-750	-500	-300	-200	-100	0
1	500	500	500	50	0	0	0	0	0

Initial Supporting table - CalculatedPerfMaxEc1

Description: Maximum desired camshaft position for Exhaust CAM - Bank1

Value Units: Maximum desired camshaft position (degCam)
X Unit: Engine Oil Temperature (degC)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[-40 -28 -16 -4 8 20 32 44 56 68 80 92 104 116 128 140 152]

Y Units: Engine Speed (rpm)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600 6000 6400 6800]

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
2	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
3	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
4	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
6	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
8	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
9	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
10	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
11	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
12	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
13	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
14	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
15	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
16	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
17	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5

Initial Supporting table - CalculatedPerfMaxEc2

Description: Maximum desired camshaft position for Exhaust CAM - Bank2

Value Units: Maximum desired camshaft position (degCam)
X Unit: Engine Oil Temperature (degC)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[-40 -28 -16 -4 8 20 32 44 56 68 80 92 104 116 128 140 152]
Y Units: Engine Speed (rpm)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600 6000 6400 6800]

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
2	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
3	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
4	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
6	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
8	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
9	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
10	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
11	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
12	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
13	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
14	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
15	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
16	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
17	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5

Initial Supporting table - CalculatedPerfMaxIc1

Description: Maximum desired camshaft position for Intake CAM - Bank1

Value Units: Maximum desired camshaft position (degCam)
X Unit: Engine Oil Temperature (degC)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[-40 -28 -16 -4 8 20 32 44 56 68 80 92 104 116 128 140 152]
Y Units: Engine Speed (rpm)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600 6000 6400 6800]

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
2	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
3	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
4	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
5	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
6	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
7	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
8	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
10	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
11	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
12	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
13	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
14	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
15	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
16	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
17	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0

Initial Supporting table - CalculatedPerfMaxIc2

Description: Maximum desired camshaft position for Intake CAM - Bank2

Value Units: Maximum desired camshaft position (degCam)
X Unit: Engine Oil Temperature (degC)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[-40 -28 -16 -4 8 20 32 44 56 68 80 92 104 116 128 140 152]
Y Units: Engine Speed (rpm)
[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17]
[400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600 6000 6400 6800]

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
2	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
3	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
4	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
5	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
6	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
7	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
8	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
9	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
10	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
11	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
12	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
13	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
14	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
15	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
16	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
17	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29

Initial Supporting table - P0521_LowMinOilPresFail - Two Stage Oil Pump

Description: Minimum expected oil presure readings

Value Units: Min oil pressure (kPa)
X Unit: Engine speed (RPM)

y/x	1,400.0	1,500.0	2,000.0	2,500.0	3,000.0	3,500.0	4,000.0	4,500.0	5,000.0
1.0	165.0	172.0	186.0	191.0	191.0	197.0	217.0	225.0	255.0

Initial Supporting table - P0521_P06DD_P06DE_OP_HiStatePressure

Description: Two Stage Oil Pump Oil Pressure in High State

Value Units: Nominal high state oil pressure (kPa)
X Unit: Engine oil temperature (deg C)

y/x	-7.0	0.0	20.0	40.0	60.0	80.0	100.0	110.0	120.0
1,400.0	636.0	636.0	636.0	636.0	585.0	533.1	464.9	405.9	346.9
1,500.0	648.7	648.7	648.7	648.7	595.4	545.6	484.3	433.3	382.3
2,000.0	700.6	700.6	700.6	700.6	646.7	605.0	545.5	503.9	462.3
2,500.0	752.6	752.6	752.6	752.6	699.5	662.4	604.2	559.6	514.9
3,000.0	765.6	765.6	765.6	765.6	742.8	705.5	643.9	596.3	548.8
3,500.0	783.4	783.4	783.4	783.4	758.8	725.1	685.5	631.7	577.8
4,000.0	754.9	754.9	754.9	754.9	785.1	755.2	700.6	640.8	580.9
4,500.0	753.7	753.7	753.7	753.7	751.1	759.1	709.1	646.9	584.8
5,000.0	762.3	762.3	762.3	762.3	751.6	753.3	732.6	677.6	622.6

Initial Supporting table - P06DD_P06DE_MaxEnableTorque_OP

Description: Two Stage Oil Pump Rationality Test Torque Max Enable Threshold

Value Units: Maximum engine torque (Nm)
X Unit: Engine speed (RPM)

y/x	1,000.0	1,250.0	1,500.0	1,750.0	2,000.0	2,250.0	2,500.0	2,750.0	3,000.0
1.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0

Initial Supporting table - P06DD_P06DE_MinEnableTorque_OP

Description: Two Stage Oil Pump Rationality Test Torque Min Enable Threshold

Value Units: Min engine torque (Nm)
X Unit: Engine speed (RPM)

y/x	1,000.0	1,250.0	1,500.0	1,750.0	2,000.0	2,250.0	2,500.0	2,750.0	3,000.0
1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Initial Supporting table - P06DD_P06DE_MinOilPressThresh

Description: Intrusive diagnostic minimum pressure limit that is a function of Engine Speed and Oil Temperature

Value Units: Minimum engine oil pressure threshold (kPa)
X Unit: Engine oil temperature (deg C)

y/x	-7	0	20	40	60	80	100	110	120
1,400	108	108	108	108	108	108	108	108	108
1,500	115	115	115	115	115	115	115	115	115
2,000	136	136	136	136	136	136	136	136	136
2,500	153	153	153	153	153	153	153	153	153
3,000	167	167	167	167	167	167	167	167	167
3,500	183	183	183	183	183	183	183	183	183
4,000	199	199	199	199	199	199	199	199	199
4,500	233	233	233	233	233	233	233	233	233
5,000	310	310	310	310	310	310	310	310	310

Initial Supporting table - P06DD_P06DE_OP_LoStatePressure

Description: Two Stage Oil Pump Oil Pressure in Low State

Value Units: Nominal low state oil pressure (kPa)
X Unit: Engine oil temperature (deg C)

y/x	-7	0	20	40	60	80	100	110	120
1,400	325	325	325	325	301	290	281	269	257
1,500	327	327	327	327	300	288	282	271	260
2,000	326	326	326	326	311	299	289	284	280
2,500	333	333	333	333	318	300	290	287	284
3,000	331	331	331	331	326	306	293	287	282
3,500	336	336	336	336	326	314	302	296	290
4,000	344	344	344	344	335	322	306	305	303
4,500	352	352	352	352	329	294	292	294	296
5,000	355	355	355	355	318	272	285	287	289

Initial Supporting table - P06DD_P06DE_OP_StateChangeMin

Description: Minimum allowed pressure change on a Two Stage Oil Pump state change

Value Units: Min pressure change (kPa)
X Unit: Engine oil temperature (deg C)

y/x	-7.0	0.0	20.0	40.0	60.0	80.0	100.0	110.0	120.0
1,400.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
1,500.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
2,000.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
2,500.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
3,000.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
3,500.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
4,000.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
4,500.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
5,000.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Initial Supporting table - P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage

Description: Identifies which Long Term Fuel Trim Cell I.D.s are used for diagnosis. Only cells identified as "CeFADD_e_NonSelectedCell" are not used for diagnosis.

Value Units: Status of Cell being NonSelected, Selected Purge On cell, or Selected Non-Purge Cell.
X Unit: Long Term Fuel Trim Cell I.D. (no units)

P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage - Part 1

y/x	CeFADR_e_Cell00_PurgOnAirMode5	CeFADR_e_Cell01_PurgOnAirMode4	CeFADR_e_Cell02_PurgOnAirMode3	CeFADR_e_Cell03_PurgOnAirMode2
1	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell

P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage - Part 2

y/x	CeFADR_e_Cell04_PurgOnAirMode1	CeFADR_e_Cell05_PurgOnAirMode0	CeFADR_e_Cell06_PurgOnIdle	CeFADR_e_Cell07_PurgOnDecel
1	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell

P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage - Part 3

y/x	CeFADR_e_Cell08_PurgOffAirMode5	CeFADR_e_Cell09_PurgOffAirMode4	CeFADR_e_Cell10_PurgOffAirMode3	CeFADR_e_Cell11_PurgOffAirMode2
1	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell

P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage - Part 4

y/x	CeFADR_e_Cell12_PurgOffAirMode1	CeFADR_e_Cell13_PurgOffAirMode0	CeFADR_e_Cell14_PurgOffIdle	CeFADR_e_Cell15_PurgOffDecel
1	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell

Initial Supporting table - P219A Normalizer Bank1 Table

Description: Bank 1 Normalizer table used in the calculation of the Ratio for the current sample period.

Value Units: Unitless Scalar
X Unit: Engine Speed (RPM)
Y Units: Air Per Cylinder (APC) (mg/cylinder)

y/x	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000
40	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
80	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
120	9,999.00	9,999.00	9,999.00	34.00	34.00	34.00	9,999.00	9,999.00	9,999.00	21.25	21.25	25.00	40.50	40.50	9,999.00	9,999.00	9,999.00
160	77.50	77.50	73.00	64.50	34.00	45.25	45.00	52.75	47.50	31.75	21.25	25.00	40.50	40.50	9,999.00	9,999.00	9,999.00
200	77.50	77.50	73.00	95.00	71.25	56.50	45.00	52.75	47.50	42.25	49.50	61.50	48.00	48.00	9,999.00	9,999.00	9,999.00
240	71.00	71.00	91.50	111.00	107.50	113.25	89.00	70.25	70.25	86.75	85.25	112.00	84.50	84.50	9,999.00	9,999.00	9,999.00
280	102.50	102.50	109.00	100.00	144.50	164.00	140.25	106.50	155.00	133.00	120.25	93.25	123.00	123.00	9,999.00	9,999.00	9,999.00
320	142.50	142.50	131.75	159.25	175.50	206.25	159.00	109.00	176.75	108.00	169.00	105.00	115.00	115.00	9,999.00	9,999.00	9,999.00
360	223.00	223.00	176.50	196.00	213.75	200.50	141.50	151.00	182.00	194.00	162.00	113.75	101.50	95.50	9,999.00	9,999.00	9,999.00
400	215.00	215.00	197.25	234.50	179.00	208.00	201.00	189.25	208.75	148.00	143.25	111.00	76.00	76.00	9,999.00	9,999.00	9,999.00
440	219.00	219.00	221.00	230.50	226.25	205.50	215.75	201.25	209.25	151.25	89.25	88.75	78.75	78.75	9,999.00	9,999.00	9,999.00
480	219.00	219.00	221.00	229.75	229.25	230.75	240.75	237.75	149.00	86.00	67.50	98.50	82.00	82.00	9,999.00	9,999.00	9,999.00
520	9,999.00	9,999.00	9,999.00	229.25	229.25	230.75	240.75	237.75	149.00	86.00	67.50	98.50	82.00	82.00	9,999.00	9,999.00	9,999.00
560	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
600	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
640	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
680	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00

Initial Supporting table - P219A Quality Factor Bank1 Table

Description: Bank 1 lookup table of Quality Factors used in the calculation of the Ratio for the current sample period

Value Units: Unitless Scalar
X Unit: Engine Speed (RPM)
Y Units: Air Per Cylinder (APC) (mg/cylinder)

y/x	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
200	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
240	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
280	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
320	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
360	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
400	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
440	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
480	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
560	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
600	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
640	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
680	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Initial Supporting table - P219A Variance Threshold Bank1 Table

Description: Bank 1 lookup table of Variance metric used to calculate the Ratio for the current sample period

Value Units: Unitless ratio
X Unit: Engine Speed (RPM)
Y Units: Air Per Cylinder (APC) (mg/cylinder)

y/x	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000
40	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
80	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
120	9,999.00	9,999.00	9,999.00	24.75	24.75	24.75	9,999.00	9,999.00	9,999.00	21.00	21.00	24.00	27.25	27.25	9,999.00	9,999.00	9,999.00
160	40.00	40.00	56.00	37.75	24.75	37.25	53.50	43.50	47.00	35.75	21.00	24.00	27.25	27.25	9,999.00	9,999.00	9,999.00
200	40.00	40.00	56.00	50.75	46.25	49.50	53.50	43.50	47.00	50.50	49.00	43.25	47.25	47.25	9,999.00	9,999.00	9,999.00
240	94.00	94.00	94.50	77.00	77.50	66.00	70.50	80.25	80.25	69.75	75.50	58.00	58.00	58.00	9,999.00	9,999.00	9,999.00
280	127.00	127.00	146.00	130.00	92.00	79.50	88.50	95.75	79.00	83.25	88.50	109.75	73.00	73.00	9,999.00	9,999.00	9,999.00
320	138.50	138.50	155.25	112.50	102.00	77.25	86.25	118.50	74.50	140.00	85.00	112.50	63.50	63.50	9,999.00	9,999.00	9,999.00
360	110.25	110.25	128.75	100.75	82.75	75.50	114.00	101.75	79.00	73.25	56.00	77.00	73.00	71.00	9,999.00	9,999.00	9,999.00
400	133.00	133.00	107.50	79.25	116.00	65.00	60.75	72.50	59.50	80.50	50.00	68.50	78.50	78.50	9,999.00	9,999.00	9,999.00
440	114.00	114.00	78.00	76.00	77.50	70.50	63.50	76.50	69.25	57.25	64.00	63.50	71.50	71.50	9,999.00	9,999.00	9,999.00
480	114.00	114.00	78.00	76.75	77.75	65.00	54.75	47.75	45.00	60.50	79.75	55.00	67.75	67.75	9,999.00	9,999.00	9,999.00
520	9,999.00	9,999.00	9,999.00	77.75	77.75	65.00	54.75	47.75	45.00	60.50	79.75	55.00	67.75	67.75	9,999.00	9,999.00	9,999.00
560	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
600	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
640	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
680	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00

Initial Supporting table - P219B Normalizer Bank2 Table

Description: Bank 2 Normalizer table used in the calculation of the Ratio for the current sample period.

Value Units: Unitless Scalar
X Unit: Engine Speed (RPM)
Y Units: Air Per Cylinder (APC) (mg/cylinder)

y/x	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000
40	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
80	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
120	9,999.00	9,999.00	74.25	74.25	66.00	66.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
160	71.00	71.00	74.25	74.25	66.00	79.25	82.00	74.00	92.00	76.75	61.25	81.25	81.25	9,999.00	9,999.00	9,999.00	9,999.00
200	71.00	71.00	122.75	114.25	109.00	92.25	82.00	74.00	92.00	99.00	61.25	81.25	120.50	160.00	9,999.00	9,999.00	9,999.00
240	210.50	210.50	174.50	154.00	168.75	112.75	59.25	128.00	122.00	143.25	94.75	122.00	160.00	160.00	9,999.00	9,999.00	9,999.00
280	210.50	179.75	149.00	136.00	118.50	151.50	107.25	121.00	122.75	135.25	82.75	111.50	119.75	119.75	9,999.00	9,999.00	9,999.00
320	9,999.00	149.00	149.00	112.25	92.50	156.00	147.75	158.50	113.00	143.00	106.00	115.00	71.25	71.25	9,999.00	9,999.00	9,999.00
360	110.50	110.50	109.25	107.75	117.75	152.50	145.00	134.50	99.00	101.00	83.50	102.00	75.25	75.25	9,999.00	9,999.00	9,999.00
400	110.50	110.50	110.50	108.75	122.75	122.75	102.75	82.50	90.00	86.00	80.00	70.50	73.00	75.25	9,999.00	9,999.00	9,999.00
440	112.25	112.25	110.25	108.00	117.25	126.50	126.50	85.50	64.75	75.25	78.25	70.50	70.50	9,999.00	9,999.00	9,999.00	9,999.00
480	112.25	112.25	110.25	108.00	104.25	104.25	106.75	109.00	86.75	64.75	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
520	9,999.00	9,999.00	9,999.00	9,999.00	104.25	104.25	106.75	109.00	109.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
560	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
600	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
640	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
680	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00

Initial Supporting table - P219B Quality Factor Bank2 Table

Description: Bank 2 lookup table of Quality Factors used in the calculation of the Ratio for the current sample period

Value Units: Unitless Scalar
X Unit: Engine Speed (RPM)
Y Units: Air Per Cylinder (APC) (mg/cylinder)

y/x	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
200	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
240	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
280	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
320	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
360	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
400	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
440	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
480	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
560	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
600	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
640	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
680	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Initial Supporting table - P219B Variance Threshold Bank2 Table

Description: Bank 2 lookup table of Variance metric used to calculate the Ratio for the current sample period

Value Units: Unitless ratio
X Unit: Engine Speed (RPM)
Y Units: Air Per Cylinder (APC) (mg/cylinder)

y/x	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000
40	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
80	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
120	9,999.00	9,999.00	30.00	30.00	45.25	45.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
160	78.50	78.50	30.00	30.00	45.25	68.50	81.75	99.50	63.50	65.00	66.50	50.25	50.25	9,999.00	9,999.00	9,999.00	9,999.00
200	78.50	78.50	99.50	80.00	74.50	92.00	81.75	99.50	63.50	69.75	66.50	50.25	64.25	78.00	9,999.00	9,999.00	9,999.00
240	76.25	76.25	120.50	129.75	86.50	119.00	83.00	76.50	83.00	79.25	77.25	66.75	78.00	78.00	9,999.00	9,999.00	9,999.00
280	76.25	97.75	119.25	119.00	117.50	93.50	66.25	100.00	101.75	88.00	109.25	67.50	78.50	78.50	9,999.00	9,999.00	9,999.00
320	9,999.00	119.25	119.25	149.00	148.25	113.25	102.00	97.00	135.75	103.00	93.50	67.25	101.50	101.50	9,999.00	9,999.00	9,999.00
360	169.00	169.00	186.25	179.50	144.25	105.25	109.25	120.75	109.00	124.25	94.00	78.50	99.50	99.50	9,999.00	9,999.00	9,999.00
400	169.00	169.00	193.00	186.50	154.50	154.50	156.25	158.25	141.00	118.75	108.50	113.00	106.25	99.50	9,999.00	9,999.00	9,999.00
440	202.75	202.75	194.25	187.00	175.25	163.50	163.50	129.50	123.75	121.25	115.75	113.00	113.00	9,999.00	9,999.00	9,999.00	9,999.00
480	202.75	202.75	195.00	187.00	183.00	183.00	144.75	106.50	115.00	123.75	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
520	9,999.00	9,999.00	9,999.00	9,999.00	183.00	183.00	144.75	106.50	106.50	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
560	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
600	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
640	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
680	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00

Initial Supporting table - 1st_FireAftrMisfr_Acel

Description: Used for P0300 - P0308, Multiplier for establishing the expected acceleration of the cylinder after the misfire

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
8	0.51	0.43	0.58	0.51	0.52	0.65	0.63	0.67	0.78	0.59	0.91	0.64	1.06	0.84	0.28	0.60	1.10
12	0.58	0.46	0.50	0.46	0.51	0.54	0.60	0.44	0.80	1.00	0.74	0.87	0.84	0.84	0.50	0.60	1.35
16	0.60	0.50	0.49	0.42	0.38	0.42	0.47	0.52	1.08	0.56	0.55	0.83	0.16	0.45	0.56	0.60	1.32
20	0.62	0.50	0.48	0.44	0.33	0.38	0.55	0.48	0.43	0.11	0.09	0.16	0.13	0.24	0.19	0.60	1.29
24	0.64	0.53	0.51	0.45	0.39	0.35	0.46	0.42	0.46	0.09	0.09	0.08	0.09	0.12	0.59	0.30	1.25
30	0.64	0.57	0.52	0.46	0.37	0.38	0.51	0.45	0.20	0.05	0.06	0.05	0.06	0.21	0.33	0.20	1.93
40	0.63	0.60	0.54	0.46	0.38	0.36	0.44	0.42	0.34	0.05	0.05	0.10	0.03	0.20	0.19	0.14	1.70
60	0.69	0.61	0.56	0.47	0.39	0.30	0.38	0.39	0.31	0.23	0.25	0.05	0.33	0.31	0.31	0.31	1.42
100	0.67	0.66	0.53	0.43	0.38	0.32	0.32	0.29	0.28	0.22	0.19	0.23	0.29	0.21	0.22	0.20	1.06

Initial Supporting table - 1st_FireAftrMisfr_Jerk

Description: Used for P0300 - P0308, Multiplier for establishing the expected Jerk of the cylinder after the misfire

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
8	0.22	-0.65	-0.86	0.04	-0.30	-0.74	-0.97	-0.50	-0.37	-1.18	-0.99	-1.02	-1.06	0.56	0.44	0.31	1.10
12	0.57	-0.49	-0.84	-0.48	-0.91	-0.73	-0.88	-1.25	-0.25	-1.41	-1.44	-1.62	-0.87	0.67	0.50	0.46	1.35
16	1.15	-0.58	-0.42	-0.30	-0.68	-0.50	-0.81	-0.83	-0.53	-1.24	-1.36	-1.39	-1.28	-1.00	0.72	0.62	1.32
20	0.86	1.26	1.08	0.93	-0.67	-0.52	-0.57	-0.91	-0.96	-1.27	-1.52	-1.52	-1.00	-1.11	-1.25	0.77	1.29
24	0.94	1.38	1.08	0.99	-0.65	-0.51	-0.62	-0.94	-0.99	-1.32	-1.15	-1.32	-0.82	-1.33	-1.38	-0.77	1.25
30	1.02	1.32	1.11	1.06	0.85	0.86	0.63	1.27	-1.20	-1.46	-1.22	-1.60	-1.74	-1.13	-1.40	-1.20	1.93
40	1.19	1.39	1.16	1.13	0.87	0.68	0.68	0.94	-1.17	-1.47	-1.27	-1.66	-1.47	-1.31	-1.38	-1.60	1.70
60	1.40	1.55	1.16	1.17	0.95	0.79	0.74	0.90	0.72	0.54	0.44	-1.22	0.96	0.35	0.62	0.61	1.42
100	1.83	1.58	1.29	1.23	0.98	0.72	0.86	1.26	1.03	0.57	0.41	0.42	0.46	0.32	0.40	0.32	1.06

Initial Supporting table -1stFireAfterMisJerkAFM

Description: Used for P0300 - P0308, Multiplier for establishing the expected jerk of the cylinder after the misfire if Active Fuel Management cylinder deact mode is active

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	800	1,000	1,200	1,600	2,000	2,400	2,600	2,800	3,000
8	0	0	-1	-1	-3	-1	0	0	0
12	0	0	-1	0	-2	-1	0	0	0
16	0	0	-1	-1	-3	-1	-1	-1	0
20	0	0	-1	-1	-1	0	-1	0	0
24	0	0	-1	-1	-1	0	-1	-1	0
30	0	-1	-1	-1	0	-2	-1	-1	0
40	0	-1	-1	-1	0	-1	-1	-1	0
60	0	0	-1	0	0	-1	-1	-1	0
100	0	0	-1	0	0	-1	-1	-1	0

Initial Supporting table -1stFireAftrMisAcelAFM

Description: Used for P0300 - P0308, Multiplier for establishing the expected acceleration of the cylinder after the misfire if Active Fuel Management cylinder deact mode is active

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	800	1,000	1,200	1,600	2,000	2,400	2,600	2,800	3,000
8	0	0	0	0	-2	0	0	0	0
12	0	0	0	0	-2	0	0	0	0
16	0	0	0	0	-2	0	0	0	0
20	0	0	0	0	-2	0	0	0	0
24	0	0	0	0	-2	0	-2	-2	0
30	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0

Initial Supporting table - Abnormal Cyl Mode

Description: Used for P0300-P0308. Number of consecutive number of decelerating cylinders after the misfire that would be considered abnormal. (Cylinder Mode Equation)

Value Units: Number of consecutive number of decelerating cylinders (integer)
X Unit: thousands of RPM (rpm/1000)

y/x	0	1	2	3	4	5	6	7	8
1	7	7	7	7	7	7	7	7	7

Initial Supporting table - Abnormal Rev Mode

Description: Used for P0300-P0308. Abnormal Rev Mode Number of consecutive number of decelerating cylinders after the misfire that would be considered abnormal. (Rev Mode Equation)

Value Units: Number of consecutive number of decelerating cylinders (integer)
X Unit: thousands of RPM (rpm/1000)

y/x	0	1	2	3	4	5	6	7	8
1	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Initial Supporting table - Abnormal SCD Mode

Description: Used for P0300-P0308. Number of consecutive number of decelerating cylinders after the misfire that would be considered abnormal. (SCD Mode Equation)

Value Units: Number of consecutive number of decelerating cylinders (integer)
X Unit: thousands of RPM (rpm/1000)

y/x	0	1	2	3	4	5	6	7	8
1	3	3	3	3	3	3	3	3	3

Initial Supporting table - Bank_SCD_Decel

Description: Used for P0300 - P0308, Mulitplier to SCD decel to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
8	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
24	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
40	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
60	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
77	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

Initial Supporting table - Bank_SCD_Jerk

Description: Used for P0300 - P0308, Mulitplier to Medres SCD jerk to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: mulitplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
8	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
10	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
18	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
24	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
30	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
40	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
60	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
77	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15

Initial Supporting table - BankCylModeDecel

Description: Used for P0300 - P0308, Mulitplier to Lores Decel to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	1.26	0.80	0.60	0.60	0.60	0.60	0.50	0.60	0.60	0.33	0.44	0.18	0.20	0.47	0.39	0.70	0.86
8	1.29	0.62	0.61	0.54	0.57	0.52	0.54	0.52	0.60	0.40	0.45	0.18	0.20	0.47	0.39	0.70	1.10
10	1.27	0.73	0.76	0.61	0.67	0.58	0.68	1.00	0.42	0.41	0.32	0.20	0.20	0.47	0.39	0.70	1.15
18	1.35	0.96	0.73	0.63	0.53	0.48	0.60	0.55	0.60	0.57	0.46	0.44	0.42	0.53	0.56	0.70	1.33
24	1.32	1.14	0.94	0.90	0.70	0.46	0.56	0.47	0.42	0.52	0.37	0.38	0.46	0.52	0.65	0.90	1.25
30	1.26	1.30	1.04	0.99	0.81	0.69	0.69	0.50	0.46	0.49	0.39	0.44	0.38	0.45	0.39	0.80	1.93
40	1.23	1.43	1.13	1.06	0.86	0.73	0.63	0.48	0.44	0.32	0.42	0.45	0.36	0.45	0.30	0.36	1.70
60	1.24	1.56	1.28	1.15	0.97	0.71	0.59	0.55	0.44	0.37	0.48	0.49	0.43	0.38	0.33	0.31	1.42
77	1.17	1.64	1.36	1.17	0.99	0.77	0.56	0.54	0.43	0.37	0.48	0.49	0.46	0.34	0.34	0.28	1.42

Initial Supporting table - BankCylModeJerk

Description: Used for P0300 - P0308, Mulitplier to Lores Jerk to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	0.77	0.84	0.70	1.27	0.96	0.75	0.64	0.68	0.81	0.86	0.53	0.68	0.65	0.39	0.22	0.15	0.86
8	1.19	0.97	1.01	1.35	1.16	0.90	0.77	0.86	0.87	0.92	0.62	0.78	0.65	0.44	0.22	0.15	1.10
10	1.61	1.88	1.81	1.65	1.30	1.40	1.42	2.30	1.15	1.11	0.78	0.78	0.90	0.39	0.17	0.15	1.15
18	1.59	1.96	1.45	1.25	1.16	1.01	1.06	1.48	1.44	1.27	1.16	1.20	1.15	0.76	0.78	0.23	1.33
24	1.79	2.83	1.66	1.42	1.32	0.92	0.98	1.64	1.31	1.44	0.89	0.90	1.14	1.33	1.15	1.00	1.25
30	1.91	2.46	1.65	1.44	1.40	1.17	1.02	1.98	1.14	1.40	0.98	1.12	1.40	0.97	1.27	1.10	1.93
40	2.08	2.31	1.61	1.51	1.44	1.07	1.00	1.74	1.15	0.91	0.96	1.11	1.27	1.17	0.81	1.00	1.70
60	2.30	2.27	1.62	1.56	1.50	1.08	1.03	1.64	1.31	0.96	1.01	1.02	1.43	0.92	1.03	0.83	1.42
77	2.39	2.08	1.58	1.55	1.50	1.08	1.07	1.56	1.33	0.92	1.00	1.06	1.36	0.92	0.95	0.68	1.42

Initial Supporting table - Catalyst_Damage_Misfire_Percentage

Description: Catalyst Damaging Misfire Percentage" Table whenever secondary conditions are met.

Value Units: percent misfire over 200 revolutions (%)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000
0	13.0	13.0	9.2	4.8	4.8	4.8	4.8	4.8
10	13.0	13.0	9.2	4.8	4.8	4.8	4.8	4.8
20	13.0	13.0	9.2	4.8	4.8	4.8	4.8	4.8
30	13.0	13.0	4.8	4.8	4.8	4.8	4.8	4.8
40	12.3	8.0	4.8	4.8	4.8	4.8	4.8	4.8
50	7.0	4.8	4.8	4.8	4.8	4.8	4.8	4.8
60	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
70	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
80	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
90	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
100	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8

Initial Supporting table - ClyAfterAFM_Decel

Description: Used for P0300 - P0308, Mulitplier to Lores decel to account for different pattern of misfire after a deactivated cylider. Similar to the second cylinder of consecutive cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	0.31	0.40	0.75	1.14	0.80	1.39	1.35	1.04	1.17
10	0.49	0.84	0.77	0.93	0.80	1.19	1.16	1.06	1.25
14	0.53	0.59	0.74	1.02	0.94	1.16	1.24	1.15	1.21
18	0.52	0.76	0.84	1.02	0.87	0.95	0.96	1.02	1.06
22	0.57	0.63	0.64	0.81	0.65	0.75	0.82	0.83	0.98
26	0.57	0.67	0.65	0.62	0.60	0.63	0.67	0.75	0.78
30	0.69	0.69	0.63	0.49	0.57	0.54	0.57	0.66	0.74
40	0.74	0.72	0.59	0.41	0.43	0.39	0.47	0.49	0.52
77	0.82	0.74	0.50	0.44	0.35	0.25	0.28	0.23	0.28

Initial Supporting table - ClyBeforeAFM_Jerk

Description: Used for P0300 - P0308, Mulitplier to Lores decel to account for different pattern of misfire before a deactivated cylider, but after an active cylinder that follows an deactive cylinder on engine that supports cylinder deactivation in non even fire patterns.. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	0.55	0.29	2.04	1.54	1.72	0.45	1.40	1.68	1.79
10	0.62	0.61	2.01	1.46	1.88	0.72	1.65	1.88	1.91
14	0.54	0.52	2.23	1.69	2.31	1.29	1.59	2.00	1.90
18	0.71	1.07	1.54	1.62	1.70	1.43	1.50	1.85	1.83
22	0.99	1.69	1.41	1.41	1.30	1.28	1.59	1.45	1.70
26	0.87	1.69	1.32	1.25	1.31	1.44	1.40	1.35	1.39
30	0.84	1.78	0.98	1.19	1.18	1.45	1.29	1.25	1.46
40	0.78	1.73	0.90	1.06	0.90	1.29	1.22	1.10	1.27
77	0.80	1.51	0.76	1.03	0.71	1.26	0.98	0.76	1.02

Initial Supporting table - CombustModeIdleTbl

Description: Used for P0300 - P0308, Only used on Diesel engines. Combustion modes that will force use of Idle table. A value of CeCMBR_i_CombModesMax means not selected.

Value Units: Enumerated value of differant combustion modes (enumeration)
X Unit: Current Combustion Mode (enumeration)

CombustModeIdleTbl - Part 1

y/x	0	1	2	3	4	5
1	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax

CombustModeIdleTbl - Part 2

y/x	6	7	8	9	10	11
1	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax

CombustModeIdleTbl - Part 3

y/x	12	13	14	15	16	
1	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	

Initial Supporting table - ConsecCylModDecel

Description: Used for P0300 - P0308, Mulitplier to Lores decel to account for different pattern of the second cylinder of consecutive misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	1.11	0.73	1.18	1.07	0.83	0.96	1.02	1.02	1.38	1.75	1.36	1.20	0.97	0.84	0.50	0.50	0.86
8	1.12	0.86	0.96	0.88	0.90	0.93	1.02	1.01	1.37	1.34	1.55	1.07	1.09	0.68	0.33	0.40	1.10
10	1.09	0.76	0.86	0.77	0.82	0.74	0.84	1.39	1.05	1.22	1.31	1.04	1.26	0.68	0.39	0.40	1.15
18	1.00	0.64	0.82	0.81	0.71	0.72	1.04	1.07	1.10	1.05	0.64	0.68	0.81	1.37	0.67	0.80	1.33
24	1.04	0.75	1.06	0.96	0.71	0.68	0.87	0.76	0.73	0.36	0.63	0.81	0.70	0.64	1.12	1.20	1.25
30	1.01	0.96	1.12	1.00	0.74	0.81	0.84	0.76	0.63	0.56	0.62	0.54	0.57	0.58	0.67	1.10	1.93
40	0.98	1.08	1.20	1.04	0.75	0.80	0.81	0.81	0.65	0.53	0.69	0.61	0.74	0.61	0.63	0.64	1.70
60	1.06	1.21	1.28	1.09	0.79	0.75	0.83	0.85	0.70	0.58	0.77	0.71	0.92	0.64	0.82	0.69	1.42
77	1.05	1.33	1.38	1.09	0.78	0.80	0.81	0.83	0.71	0.59	0.78	0.79	0.99	0.64	0.88	0.75	1.42

Initial Supporting table - ConsecCylModeJerk

Description: Used for P0300 - P0308, Mulitplier to Lores Jerk to account for different pattern of the second cylinder of consecutive misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	-1	-1	-1	0	-1	0	-1	0	0	0	0	0	0	0	0	0	1
8	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	0	-1	-1	0	0	0	1
10	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	-1	0	0	0	1
18	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	1
24	-1	-1	-1	-1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	1
30	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	2
40	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-2	-1	-1	-2	2
60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-1	-2	-2	1
77	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-1	-2	-1	1

Initial Supporting table - ConsecSCD_Decel

Description: Used for P0300 - P0308, Mulitplier to medres decel to account for different pattern of the second cylinder of consecutive misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
8	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
10	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
18	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
24	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
30	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
40	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
60	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
77	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

Initial Supporting table - ConsecSCD_Jerk

Description: Used for P0300 - P0308, Mulitplier to medres Jerk to account for different pattern of the second cylinder of consecutive misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
8	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
10	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
18	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
24	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
30	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
40	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
60	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
77	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17

Initial Supporting table - CylAfterAFM_Jerk

Description: Used for P0300 - P0308, Mulitplier to Lores Jerk to account for different pattern of misfire after a deactivated cylider.   Similar to the second cylinder of consecutive cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	-1	-1	-1	-1	-1	-1	-1	-1	-1
10	-1	-1	-1	-1	-1	-1	-1	-1	-1
14	-1	-1	-2	-2	-2	-2	-1	-1	-1
18	-1	-2	-2	-2	-2	-2	-2	-2	-2
22	-1	-2	-2	-2	-1	-2	-2	-2	-2
26	-1	-2	-2	-2	-2	-2	-1	-2	-2
30	-1	-2	-2	-2	-2	-2	-2	-2	-2
40	-1	-2	-2	-2	-2	-2	-2	-2	-2
77	-1	-2	-2	-2	-1	-1	-2	-2	-2

Initial Supporting table - CylBeforeAFM_Decel

Description: Used for P0300 - P0308, Mulitplier to Lores decel to account for different pattern of misfire before a deactivated cylider, but after an active cylinder that follows an deactive cylinder on engine that supports cylinder deactivation in non even fire patterns.. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	0.23	0.00	1.14	0.79	0.56	0.58	0.81	0.58	0.80
10	0.25	0.05	0.94	0.69	0.57	0.62	0.81	0.67	0.88
14	0.29	0.34	0.58	0.83	0.62	0.76	0.97	0.81	0.88
18	0.44	0.53	0.73	0.83	0.61	0.62	0.76	0.68	0.83
22	0.36	0.38	0.50	0.68	0.48	0.58	0.69	0.58	0.68
26	0.34	0.38	0.42	0.58	0.45	0.72	0.66	0.67	0.59
30	0.38	0.41	0.38	0.50	0.40	0.65	0.59	0.60	0.59
40	0.39	0.44	0.32	0.41	0.27	0.55	0.56	0.55	0.48
77	0.40	0.41	0.20	0.47	0.21	0.52	0.45	0.40	0.38

Initial Supporting table - CylModeDecel

Description: Used for P0300-P0308. Crankshaft decel threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Delta time per cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

CylModeDecel - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	3,019	3,019	1,855	1,304	787	614	454	339	257	128	83	64	50
6	3,019	3,019	1,855	1,304	787	614	428	313	257	128	83	64	50
8	3,215	3,215	2,254	1,295	917	600	444	327	246	127	83	64	48
10	3,412	3,412	2,317	1,328	1,030	643	508	350	192	155	106	76	63
12	3,542	3,542	2,428	1,701	1,140	792	584	396	293	174	134	76	60
14	3,706	3,706	2,482	1,875	1,423	919	680	489	343	178	105	80	54
16	4,000	4,000	2,657	1,972	1,489	1,094	799	562	406	179	106	84	61
18	4,262	4,262	3,057	2,111	1,600	1,243	875	543	430	209	120	97	75
20	4,524	4,524	3,085	2,265	1,635	1,323	1,034	615	547	236	138	122	86
22	4,932	4,932	3,163	2,348	1,700	1,304	1,121	649	602	313	174	134	93
24	5,015	5,015	3,304	2,427	1,747	1,354	1,185	731	666	354	203	151	108
26	5,244	5,244	3,392	2,542	1,806	1,494	1,326	764	681	407	236	157	116
30	5,996	5,996	3,621	2,714	1,994	1,657	1,339	882	774	472	319	194	146
40	7,501	7,501	4,342	3,281	2,453	2,045	1,706	1,185	949	626	470	314	219
60	9,815	9,815	5,961	4,372	3,398	2,737	2,628	1,765	1,312	927	590	487	319
78	12,716	12,716	7,228	5,304	4,289	3,477	3,150	2,311	1,709	1,207	686	655	408
97	15,428	15,428	8,620	6,941	5,335	4,260	3,649	2,976	2,238	1,531	789	837	531

CylModeDecel - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	32	29	28	20	18	13	10	10	9	8	5	9	8
6	32	29	28	20	18	13	10	10	9	8	5	9	8
8	32	30	28	20	18	13	10	10	9	8	5	9	8
10	39	35	28	20	18	13	10	10	9	8	5	9	8
12	47	36	26	24	19	13	10	10	9	8	5	9	8
14	42	33	27	22	19	15	10	10	9	8	5	9	8
16	47	37	30	24	19	13	10	10	9	8	5	9	8
18	56	45	34	26	22	13	10	9	9	8	5	9	8
20	65	48	39	30	24	14	11	9	8	8	5	9	8
22	75	53	45	33	27	16	11	9	8	8	5	9	8
24	82	64	47	35	29	17	13	10	9	7	5	9	8

Initial Supporting table - CylModeDecel

26	90	68	51	44	31	20	14	11	10	7	6	9	8
30	110	81	60	47	40	25	17	12	9	7	5	6	6
40	163	105	83	68	57	37	22	17	14	8	7	8	7
60	248	166	151	106	87	66	39	31	20	16	13	17	15
78	328	216	198	137	113	87	54	43	25	22	18	21	19
97	417	273	252	171	143	112	71	55	32	29	23	25	24

Initial Supporting table - CylModeJerk

Description: Crankshaft jerk threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
Y Units: percent load of max indicated torque (%)

CylModeJerk - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	3,114	3,114	1,813	1,196	731	493	425	325	230	129	70	57	43
6	3,114	3,114	1,813	1,122	731	493	425	325	230	129	70	57	43
8	3,833	3,833	2,083	1,084	839	564	425	312	211	117	74	55	43
10	4,051	4,051	1,988	1,205	831	688	491	358	169	139	91	61	52
12	4,697	4,697	2,505	1,452	1,165	869	618	443	293	135	111	64	50
14	4,062	4,062	2,658	1,659	1,425	1,002	837	542	331	130	93	59	50
16	4,213	4,213	2,827	1,932	1,924	1,097	803	622	339	163	107	70	41
18	6,677	6,677	3,666	2,151	1,665	1,163	869	659	361	186	125	84	57
20	7,044	7,044	3,055	2,387	1,798	1,236	954	890	367	178	120	96	63
22	7,500	7,500	3,174	2,639	1,887	1,366	1,055	839	374	236	160	113	64
24	7,899	7,899	3,283	2,841	1,998	1,456	1,213	885	378	252	180	118	86
26	8,213	8,213	3,432	3,043	2,109	1,561	1,324	962	384	269	200	131	91
30	9,040	9,040	4,520	3,430	2,397	1,887	1,528	1,141	442	393	254	151	125
40	11,179	11,179	6,110	4,406	2,995	2,488	2,125	1,488	633	508	346	253	199
60	15,057	15,057	8,435	6,419	4,368	3,529	3,037	2,137	1,000	748	517	405	326
78	18,678	18,678	11,052	8,147	5,452	4,521	3,836	2,604	1,295	997	652	535	430
97	21,608	21,608	14,034	10,240	6,671	5,712	4,792	3,123	1,643	1,264	793	679	552

CylModeJerk - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	39	25	21	17	16	11	9	10	9	8	7	6	5
6	39	25	21	17	16	11	9	10	9	8	7	6	5
8	39	25	21	17	16	11	9	10	9	8	7	6	5
10	40	26	21	17	16	11	9	10	9	8	7	6	5
12	38	29	21	18	15	10	9	10	9	8	7	6	5
14	35	31	23	19	16	14	9	10	9	8	7	6	5
16	39	29	25	21	16	12	9	10	9	8	7	6	5
18	43	37	27	23	20	12	9	7	9	8	7	6	5
20	49	42	31	27	22	14	9	8	6	8	7	6	5
22	61	43	36	24	24	14	10	8	7	7	7	6	5
24	73	54	42	29	26	15	11	8	7	6	7	6	5

Initial Supporting table - CylModeJerk

26	74	61	45	33	27	17	12	10	7	6	7	6	5
30	93	72	51	34	24	20	15	12	8	6	5	7	5
40	144	92	68	48	37	23	18	14	11	6	5	8	7
60	232	145	120	72	56	34	30	22	15	9	9	11	9
78	308	190	154	96	76	44	40	29	20	11	14	14	10
97	391	238	197	121	97	54	51	37	26	14	19	18	12

Initial Supporting table -DeacCylInversionDecel

Description: Used for P0300 - P0308, Negative Torque can cause crank readings to invert (active cylinders appear weak & deactivated cylinders appear "strong" If deactivated cylinders don't decelerate at least this amount then the crank signal is inverting. Function of speed and load.

Value Units: Delta time per cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	79	87	53	49	46	38	24	22	14
10	101	205	95	69	56	45	33	31	20
14	270	159	97	79	49	58	48	35	23
18	381	251	127	110	98	64	53	38	29
22	537	457	238	161	98	77	59	49	33
26	822	582	362	238	147	89	86	59	42
30	1,047	686	606	307	216	119	111	79	53
40	1,664	976	655	402	268	142	138	107	81
77	3,581	2,063	1,761	839	541	258	272	211	153

Initial Supporting table - DeacCylInversionJerk

Description: Used for P0300 - P0308, Negative Torque can cause crank readings to invert (active cylinders appear weak & deactivated cylinders appear "strong" If deactivated cylinders don't jerk at least this amount then the crank signal is inverting. Function of speed and load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	707	160	111	169	108	60	47	31	18
10	999	310	212	216	132	88	65	50	34
14	1,352	524	447	287	177	138	113	84	53
18	1,439	624	431	337	256	158	121	91	70
22	1,996	969	621	419	259	195	143	121	80
26	2,476	1,149	953	591	376	222	183	135	102
30	2,684	1,356	1,042	728	511	280	239	174	130
40	3,511	1,937	1,438	967	633	350	323	248	202
77	7,010	3,874	3,024	1,963	1,193	672	602	479	388

Initial Supporting table -EngineOverSpeedLimit

Description: Engine OverSpeed Limit versus gear

Value Units: RPM
X Unit: Enumeration of transmission gear state (enumeration)

EngineOverSpeedLimit - Part 1

y/x	CeTGRR_e_TransGr1	CeTGRR_e_TransGr2	CeTGRR_e_TransGr3	CeTGRR_e_TransGr4	CeTGRR_e_TransGr5	CeTGRR_e_TransGr6	CeTGRR_e_TransGr9
1	7,100	7,100	6,500	6,500	6,500	6,500	6,500

EngineOverSpeedLimit - Part 2

y/x	CeTGRR_e_TransGr10	CeTGRR_e_TransGrNeut	CeTGRR_e_TransGrRvrs	CeTGRR_e_TransGrPark	CeTGRR_e_TransGr7	CeTGRR_e_TransGr8	
1	6,500	3,200	4,000	3,200	6,500	6,500	

Initial Supporting table - IdleCyl_Decel

Description: Used for P0300-P0308. Crankshaft decel threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Delta time per cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	6,108	6,008	3,000	1,577	1,400	677	725	375	400	300	180	119	80
6	6,235	6,135	3,000	1,306	1,366	617	725	470	400	300	180	91	73
8	6,346	6,246	3,046	1,221	1,173	643	737	512	400	254	143	95	69
10	6,458	6,358	3,100	1,365	953	615	693	379	288	229	103	86	77
12	6,569	6,469	3,169	1,601	1,066	726	581	435	265	199	116	87	70
14	6,681	6,581	3,362	1,826	1,327	869	631	467	350	211	137	99	75
16	6,792	6,692	3,584	2,080	1,505	1,011	705	542	381	220	158	107	88
18	6,904	6,804	3,618	2,307	1,684	1,154	904	665	453	301	188	121	96
20	7,073	6,916	4,116	2,523	1,863	1,362	1,016	808	539	332	223	150	112
22	7,649	7,027	4,412	2,677	2,042	1,458	1,127	870	627	416	299	188	130
24	8,225	7,119	5,000	2,835	2,220	1,588	1,186	932	674	469	334	201	144
26	8,702	7,175	5,000	3,083	2,449	1,726	1,158	951	713	512	360	204	154
30	9,327	7,789	5,173	3,597	2,757	2,012	1,355	1,058	837	591	408	229	177
40	9,976	9,976	6,653	4,472	3,650	2,726	1,848	1,428	1,234	863	555	367	270
60	9,976	9,976	9,976	6,517	5,438	4,155	2,834	2,167	1,777	1,131	838	556	431
78	9,976	9,976	9,976	8,307	7,002	5,406	3,727	2,842	2,332	1,485	991	625	476
97	11,751	10,683	9,976	9,976	8,460	6,571	4,700	3,600	2,850	1,815	1,212	764	583

Initial Supporting table - IdleCyl_Jerk

Description: Crankshaft jerk threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	5,708	5,608	2,486	1,673	1,500	695	750	400	400	300	150	125	80
6	5,835	5,735	2,435	1,315	1,431	568	750	495	400	300	185	120	74
8	5,946	5,846	2,546	1,284	1,173	643	750	675	400	254	197	129	84
10	6,058	5,958	2,600	1,365	968	694	693	675	277	229	112	113	100
12	6,169	6,069	3,118	1,547	1,142	857	599	675	262	188	199	85	73
14	6,281	6,181	3,514	1,755	1,326	1,020	636	467	350	208	152	87	68
16	6,392	6,292	3,579	1,979	1,504	1,183	742	541	397	306	146	99	77
18	6,504	6,404	3,746	2,220	1,685	1,347	841	615	415	284	172	113	87
20	7,073	6,516	4,058	2,516	1,865	1,510	1,008	762	445	287	209	137	102
22	7,649	6,627	4,853	2,666	2,038	1,673	1,090	835	519	360	261	165	117
24	8,225	7,082	5,000	2,936	2,217	1,836	1,195	879	552	395	292	187	138
26	8,702	7,585	5,057	3,187	2,395	2,049	1,231	935	606	426	310	199	152
30	9,327	8,374	5,617	3,597	2,751	2,326	1,439	1,107	729	497	361	227	177
40	9,976	9,976	7,176	4,472	3,642	3,143	1,959	1,428	1,101	725	505	356	254
60	9,976	9,976	9,945	6,517	5,424	4,776	2,998	2,167	1,522	917	807	603	432
78	9,976	9,976	9,976	8,307	6,983	6,123	3,908	2,814	1,994	1,231	935	652	449
97	11,751	10,683	9,976	9,976	8,436	7,000	4,755	3,417	2,434	1,650	1,144	799	550

Initial Supporting table - IdleSCD_Decel

Description: Used for P0300-P0308. Crankshaft decel threshold while in SCD mode. SCD mode uses smaller windows near TDC. Thresholds are a function of rpm and % engine Load. Note: Misfire's Load term is %, but not PID$04. PID $04 is not robust to temperature and alititude shifts. (especially decel and jerk thresholds since they track actual air trapped in cylinder)

Value Units: Delta time per cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	5,423	5,328	2,362	1,589	1,425	660	713	380	380	285	143	119	76
6	5,543	5,448	2,313	1,249	1,360	540	713	470	380	285	176	114	70
8	5,649	5,554	2,419	1,220	1,115	611	713	642	380	241	187	122	80
10	5,755	5,660	2,470	1,297	919	659	658	642	263	218	107	107	95
12	5,861	5,766	2,962	1,470	1,085	814	569	642	249	179	189	80	69
14	5,967	5,872	3,338	1,668	1,260	969	604	444	332	198	145	83	65
16	6,073	5,978	3,400	1,880	1,429	1,124	705	514	377	291	139	94	73
18	6,179	6,084	3,559	2,109	1,601	1,279	799	584	394	270	163	107	82
20	6,720	6,190	3,856	2,390	1,772	1,435	958	724	423	273	199	130	97
22	7,266	6,295	4,611	2,533	1,936	1,589	1,035	793	493	342	248	157	111
24	7,813	6,728	4,750	2,789	2,106	1,745	1,136	835	525	375	277	178	131
26	8,267	7,206	4,804	3,028	2,275	1,947	1,170	888	576	404	294	189	144
30	8,861	7,956	5,336	3,417	2,614	2,210	1,367	1,052	692	472	343	216	168
40	9,477	9,477	6,817	4,248	3,460	2,986	1,861	1,357	1,046	689	480	339	242
60	9,477	9,477	9,448	6,191	5,153	4,537	2,848	2,059	1,446	872	766	573	410
78	9,477	9,477	9,477	7,892	6,634	5,817	3,712	2,673	1,895	1,170	888	619	427
97	11,164	10,149	9,477	9,477	8,014	6,650	4,518	3,246	2,312	1,568	1,087	759	523

Initial Supporting table - IdleSCD_Jerk

Description: Used for P0300-P0308. Crankshaft jerk threshold while in SCD mode. SCD mode uses smaller windows near TDC. Thresholds are a function of rpm and % engine Load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	5,803	5,708	2,850	1,498	1,330	643	689	357	380	285	171	114	76
6	5,923	5,828	2,850	1,241	1,297	587	689	447	380	285	171	86	70
8	6,029	5,934	2,894	1,160	1,115	611	700	486	380	241	136	90	66
10	6,135	6,040	2,945	1,297	906	584	658	360	274	218	98	82	74
12	6,241	6,146	3,011	1,521	1,013	689	552	413	252	189	110	83	66
14	6,347	6,252	3,194	1,735	1,260	825	599	444	332	200	130	94	71
16	6,453	6,358	3,405	1,976	1,430	961	670	515	362	209	150	101	84
18	6,559	6,464	3,437	2,192	1,600	1,097	859	632	430	286	179	115	91
20	6,720	6,570	3,910	2,397	1,770	1,294	965	768	512	315	212	142	106
22	7,266	6,675	4,191	2,543	1,939	1,385	1,070	827	596	396	284	179	123
24	7,813	6,763	4,750	2,694	2,109	1,509	1,127	885	640	445	317	191	137
26	8,267	6,816	4,750	2,929	2,327	1,640	1,100	904	677	487	342	194	146
30	8,861	7,400	4,914	3,417	2,619	1,911	1,287	1,005	796	562	387	218	168
40	9,477	9,477	6,321	4,248	3,468	2,590	1,755	1,357	1,172	820	527	349	257
60	9,477	9,477	9,477	6,191	5,166	3,948	2,692	2,059	1,688	1,075	796	528	409
78	9,477	9,477	9,477	7,892	6,652	5,135	3,540	2,700	2,216	1,411	942	594	453
97	11,164	10,149	9,477	9,477	8,037	6,243	4,465	3,420	2,707	1,725	1,151	726	554

Initial Supporting table - InfrequentRegen

Description: Used for P0300-P0308. Only used on Diesel engines. Initiates a misfire delay when the current combustion mode matchs a selection in the table. A value of CeCMBR_i_CombModesMax means not selected.

Value Units: Enumerated value of differant combustion modes (enumeration)
X Unit: Current Combustion Mode (enumeration)

InfrequentRegen - Part 1

y/x	0	1	2	3	4	5
1	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax

InfrequentRegen - Part 2

y/x	6	7	8	9	10	11
1	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax

InfrequentRegen - Part 3

y/x	12	13	14	15	16	
1	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	CeCMBR_i_CombModesMax	

Initial Supporting table - Number of Normals

Description: Used for P0300-P0308. Number of Normals for the Driveline Ring Filter
After a low level misfire, another misfire may not be detectable until driveline ringing ceases. If no ringing seen, stop filter early.

Value Units: Number of Engine cycles after isolated misfire (Engine cycles)
X Unit: thousands of RPM   (rpm/1000)

y/x	0	1	2	3	4	5	6	7	8
1	2	2	2	2	2	2	2	2	2

Initial Supporting table - P0068_Delta MAF Threshold f(TPS)

Description: Table of delta MAF values as a function of desired throttle position. The output of this table provides a delta MAF that if the measured minus the estimated MAF exceeds, is considered a fail.

Value Units: Delta MAF Values (dm)
X Unit: Desired Throttle Position (Pct)

y/x	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	100.00
1.00	18.95	19.70	14.20	19.48	14.28	31.40	35.20	56.65	255.00

Initial Supporting table - P0068_Delta MAP Threshold f(TPS)

Description: Table of delta MAP values as a function of desired throttle position. The output of this table provides a delta MAP that if the measured minus the estimated MAP exceeds, is considered a fail.

Value Units: Delta MAP Values (kPa)
X Unit: Desired Throttle Position (Pct)

y/x	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	100.00
1.00	40.13	36.99	20.80	19.78	11.14	22.44	21.73	18.77	255.00

Initial Supporting table -P0068_Maximum MAF f(RPM)

Description: Table of maximum MAF values vs. engine speed. This is the maximum MAF the engine can see under all ambient conditions.

Value Units: Delta MAF Values (dm)
X Unit: Engine Speed (RPM)

y/x	600.00	1,400.00	2,200.00	3,000.00	3,800.00	4,600.00	5,400.00	6,200.00	7,000.00
1.00	20.00	50.00	80.00	115.00	150.00	176.00	194.00	203.00	210.00

Initial Supporting table - P0068_Maximum MAF f(Volts)

Description: Table of maximum MAF values vs. system voltage. The output of the air meter is clamped to lower values as system voltage drops off.

Value Units: Delta MAF Values (dm)
X Unit: System Voltage (V)

y/x	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00
1.00	0.00	20.00	60.00	150.00	250.00	300.00	300.00	300.00	300.00

Initial Supporting table - P0089 - P163A - P228C - P228D - P0191 - Engine run time threshold to Enable Diagnostic

Description: The High Pressure Control Performance Diagnostic and Pump Current Diagnostic will not run when the engine run time is below this timer following an engine start.

Value Units: Engine Run Time (Seconds)
X Unit: Coolant Temperature (Deg C)

y/x	-30	-20	-10	0	10	20	80	100	110
1	60.0	60.0	40.0	10.0	10.0	10.0	20.0	40.0	60.0

Initial Supporting table - P00C6 - High Pressure Pump Control Mode timeout

Description: High Pressure Pump Control Mode timeout

Value Units: Time (Seconds)
X Unit: Coolant Temperature (Deg C)

y/x	-30	-27	-25	-20	-10	0	8	16	20	24	32	40	48	64	80	90	112
1	10.0	10.0	10.0	9.0	7.0	5.0	4.0	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Initial Supporting table - P00C6 - maximum acceptable counts of fuel rail pressure below KtFHPD_p_HPS_PressFallLoThrsh after High Pressure Start

Description: The maximum acceptable counts of fuel rail pressure below KtFHPD_p_HPS_PressFallLoThrsh after High Pressure Start (HPS) is executed but before engine is in run mode.

Value Units: maximum acceptable counts of fuel rail pressure below KtFHPD_p_HPS_PressFallLoThrsh after High Pressure Start (Count)
X Unit: Ethanol Precent (%)
Y Units: Coolant Temperature (Deg C)

y/x	-30	-27	-25	-20	-10	0	8	16	20	24	32	40	48	64	80	90	112
0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
13	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
25	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
38	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
50	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
63	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
75	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
88	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
100	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

Initial Supporting table - P00C6 - Minimum acceptable value of fuel rail pressure after High Pressure Start

Description: The minimum acceptable value of fuel rail pressure after High Pressure Start (HPS) is executed. This ensures the pressure does not fall off drastically after High Pressure Start (HPS) is executed, but before engine is in run mode.

Value Units: Minimum acceptable value of fuel rail pressure after High Pressure Start (Mpa)
X Unit: Ethanol Precent (%)
Y Units: Coolant Temperature (Deg C)

y/x	-30	-27	-25	-20	-10	0	8	16	20	24	32	40	48	64	80	90	112
0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
13	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
38	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
63	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
75	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
88	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
100	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Initial Supporting table - P00C6 - Minimum pressure in MPa that will exit High Pressure Start mode and allow fuel delivery

Description: This calibration is the minimum pressure in MPa that will exit High Pressure Start mode and allow fuel delivery

Value Units: Minimum pressure in MPa that will exit High Pressure Start mode and allow fuel delivery
X Unit: Ethanol Precent (%)
Y Units: Coolant Temperature (Deg C)

y/x	-30	-27	-25	-20	-10	0	8	16	20	24	32	40	48	64	80	90	112
0	20.0	18.0	17.0	15.0	12.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0
13	20.0	18.0	17.0	15.0	12.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0
25	20.0	18.0	17.0	15.0	12.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0
38	20.0	18.0	17.0	15.0	12.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0
50	20.0	18.0	17.0	15.0	12.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0
63	20.0	18.0	17.0	15.0	12.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	4.0
75	20.0	18.0	17.0	15.0	12.0	8.0	8.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	4.0
88	20.0	18.0	17.0	15.0	12.0	8.0	8.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	4.0
100	20.0	18.0	17.0	15.0	12.0	8.0	8.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	4.0

Initial Supporting table - P0191 - High fail limit of fuel control due to high pressure sensor skewed High

Description: High fail limit of fuel control due to high pressure sensor skewed High error as Function of desired pressure

Value Units: Ratio
X Unit: Desired Pressure (Mpa)

y/x	0.00	3.00	7.00	15.00	20.00	25.00	27.50	32.00	36.00
1.00	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.09	1.05

Initial Supporting table - P0191 - Low fail limit of fuel control due to pressure sensor skewed low

Description: Low fail limit of fuel control due to pressure sensor skewed low error as Function of desired pressure

Value Units: Ratio
X Unit: Desired Pressure (Mpa)

y/x	0.00	3.00	7.00	15.00	20.00	25.00	27.50	32.00	36.00
1.00	0.75	0.75	0.75	0.75	0.79	0.82	0.86	0.92	0.95

Initial Supporting table - P0326_P0331_AbnormalNoise_Thresh_AFM

Description: Fail threshold for the Knock Performance Abnormal Noise Diagnostic when engine IS in AFM mode

Value Units: Filtered background engine noise. Unit-less term from the Knock Detection Fast Fourier Transform (FFT) for a selected frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	0.060	0.060	0.060	0.060	0.060	0.069	0.149	0.239	0.340	0.449	0.569	0.699	0.840	0.840	0.840	0.840	0.840

Initial Supporting table - P0606_Last Seed Timeout f(Loop Time)

Description: The max time for the Last Seed Timeout as a function of operating loop time sequence.

Value Units: Max Time for Last Seed Timeout (ms)
X Unit: Operating Loop Sequence (enum)

P0606_Last Seed Timeout f(Loop Time) - Part 1

y/x	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq	CePISR_e_40msSeq
1	200.000	200.000	200.000	200.000	200.000	200.000	200.000

P0606_Last Seed Timeout f(Loop Time) - Part 2

y/x	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq	
1	200.000	200.000	500.000	8,191.875	8,191.875	8,191.875	

Initial Supporting table - P0606_Program Sequence Watch Enable f(Core, Loop Time)

Description: The enabling flags for the program sequence watch as a function of processor core and operating loop time sequence.

Value Units: PSW enable flag (boolean)
X Unit: Processor Core (enum)
Y Units: Operating Loop Time Sequence (enum)

y/x	CeTSKR_e_CPU	CeTSKR_e_CPU2	CeTSKR_e_CPU3	CeTSKR_e_CPU4
CePISR_e_5msSeq	0	0	0	0
CePISR_e_6p25msSeq	1	1	0	0
CePISR_e_10msSeq	0	0	0	0
CePISR_e_12p5msSeq	1	1	0	0
CePISR_e_20msSeq	0	0	0	0
CePISR_e_25msSeq	1	1	0	0
CePISR_e_40msSeq	0	0	0	0
CePISR_e_50msSeq	1	1	0	0
CePISR_e_80msSeq	0	0	0	0
CePISR_e_100msSeq	1	1	0	0
CePISR_e_EventA_Seq	1	0	0	0
CePISR_e_EventB_Seq	0	0	0	0
CePISR_e_EventC_Seq	0	0	0	0

Initial Supporting table - P0606_PSW Sequence Fail f(Loop Time)

Description: Fail threshold for PSW per operating loop.

Value Units: Fail threshold for PSW (count)
X Unit: Operating Loop (enum)

P0606_PSW Sequence Fail f(Loop Time) - Part 1

y/x	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq	CePISR_e_40msSeq
1	5	3	5	3	5	3	5

P0606_PSW Sequence Fail f(Loop Time) - Part 2

y/x	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq	
1	5	5	5	3	5	5	

Initial Supporting table - P0606_PSW Sequence Sample f(Loop Time)

Description: Sample threshold for PSW per operating loop.

Value Units: Sample threshold for PSW (count)
X Unit: Operating Loop (enum)

P0606_PSW Sequence Sample f(Loop Time) - Part 1

y/x	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq	CePISR_e_40msSeq
1	4	4	4	4	4	4	4

P0606_PSW Sequence Sample f(Loop Time) - Part 2

y/x	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq	
1	4	4	4	4	4	4	

Initial Supporting table - P1682_PT Relay Pull-in Run/Crank Voltage f(IAT)

Description: The Run/Crank voltages required to pull in the PT relay as a function of induction air temperature.

Value Units: Run/Crank Voltages required to pull in PT Relay (V)
X Unit: Induction Air Temperature (deg C)

y/x	23.0	85.0	95.0	105.0	125.0
1	7.000	8.699	9.000	9.199	10.000

Initial Supporting table - P16F3_Delta MAP Threshold f(Desired Engine Torque)

Description: Engine Sync based and Time based delta pressure threshold above which Torque Security error is reported.

Value Units: Torque Security Threshold for Engine Sync and Time Based Delta Pressure (kPa)
X Unit: Desired Engine Torque (Nm)

y/x	0.00	50.00	100.00	150.00	200.00	300.00
1.00	11.14	11.14	11.14	11.14	11.14	11.14

Initial Supporting table - P16F3_Delta Spark Threshold f(RPM,APC)

Description: Threshold for determining when the difference between commanded spark and applied spark exceeds the torque security requirement. It is a function of engine rpm and APC.

Value Units: Torque Security Threshold for difference between Commanded Spark and Applied Spark (phi)
X Unit: Engine Speed (RPM)
Y Units: APC (m)

y/x	500.00	980.74	1,461.48	1,942.23	2,422.97	2,903.71	3,384.45	3,865.20	4,345.94	4,826.68	5,307.42	5,788.16	6,268.91	6,749.65	7,230.39	7,711.13	8,191.88
80.00	125.00	35.81	33.52	30.89	32.09	32.45	30.25	26.19	20.59	19.48	18.94	18.64	18.77	18.89	18.91	18.91	18.91
160.00	125.00	28.31	26.50	25.78	27.39	27.19	24.66	21.67	18.31	17.70	17.44	17.16	16.83	16.52	16.48	16.48	16.48
240.00	125.00	22.63	21.94	22.13	23.83	23.39	20.83	18.55	16.50	15.86	15.41	15.11	15.06	15.00	15.00	15.00	15.00
320.00	125.00	18.47	18.69	19.36	21.08	20.45	17.63	15.91	15.09	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
400.00	125.00	15.61	16.19	16.94	18.88	17.80	15.86	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
480.00	125.00	15.00	15.00	15.06	16.58	15.61	15.19	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
560.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
640.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
720.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
800.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
880.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
960.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,040.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,120.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,200.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,280.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1,360.00	125.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00

Initial Supporting table - P16F3_Speed Control External Load f(Oil Temp, RPM)

Description: Specifies the external load table for SPDR torque security as a function of engine oil temperature and engine RPM.

Value Units: External Load Table for SPDR (Nm)
X Unit: Engine Oil Temperature (deg C)
Y Units: Engine Speed (RPM)

y/x	-40.00	-20.00	-10.00	0.00	50.00	90.00
200.00	332.75	332.75	332.75	332.75	332.75	332.75
400.00	332.75	332.75	332.75	332.75	332.75	189.41
600.00	332.75	275.54	287.16	332.75	200.93	96.69
700.00	317.11	251.60	261.45	301.80	185.94	63.34
800.00	285.12	232.19	243.38	277.55	174.75	45.04
900.00	259.63	214.40	228.01	256.36	157.63	35.29
1,000.00	237.32	180.83	209.09	234.66	136.70	32.45
1,100.00	203.18	155.14	178.46	202.51	104.94	29.51
1,300.00	157.18	128.95	136.60	157.07	72.37	20.73
1,500.00	128.34	102.62	110.05	130.66	52.84	8.11
2,000.00	72.51	52.06	44.47	53.25	-0.24	-22.82
2,500.00	58.66	39.40	31.61	40.45	-10.64	-31.95
3,000.00	54.68	35.69	27.63	36.47	-14.62	-34.64
3,500.00	52.20	33.34	25.15	33.98	-17.10	-36.66
4,500.00	47.01	27.89	19.96	28.79	-22.29	-43.35
5,500.00	37.31	17.87	10.26	19.09	-31.99	-55.03
6,500.00	23.63	4.17	-3.42	5.41	-45.67	-68.80

Initial Supporting table - P228C - High Pressure Pump Control (HPC) fail threshold of pressure too low

Description: The High Pressure Pump Control (HPC) fail threshold of pressure too low test as a function of desired fuel pressure.

Value Units: Pressure Error - Desired pressure - Actual Pressure (Mpa)
X Unit: Desired Pressure (Mpa)

y/x	0	3	7	15	20	25	28	32	36
1	3	3	3	3	3	3	3	3	3

Initial Supporting table - P228D - High Pressure Pump Control (HPC) fail threshold for pressure too high

Description: The High Pressure Pump Control (HPC) fail threshold for pressure too high test as a function of desired fuel pressure.

Value Units: Pressure Error - Desired pressure - Actual Pressure (Mpa)
X Unit: Desired Pressure (Mpa)

y/x	0	3	7	15	20	25	28	32	36
1	-3	-3	-3	-3	-3	-3	-3	-3	-3

Initial Supporting table - P2635 Max Fuel Flow

Description: P2635 Maximum Fuel Flow Disable Criteria
Maximum allowed fuel flow values above which the diagnostic is disabled

Value Units: grams / second
X Unit: kilopascals [desired fuel pressure]
Y Units: volts [device supply]

y/x	200.0000	250.0000	300.0000	350.0000	400.0000	450.0000	500.0000	550.0000	600.0000
4.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
6.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
7.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
9.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
10.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
12.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
13.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
15.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
16.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
18.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
19.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
21.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
22.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
24.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
25.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
27.0000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922
28.5000	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922	511.9922

Initial Supporting table - P2635 Threshold High

Description: P2635 Filtered Fuel Pressure Error High Threshold [under-performing pump]
Instantaneously calculated filtered fuel pressure error

Value Units: kilopascals
X Unit: kilopascals [desired fuel pressure]
Y Units: grams / second [fuel flow]

y/x	200.0	250.0	300.0	350.0	400.0	450.0	500.0	550.0	600.0
0.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
1.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
3.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
4.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
6.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
7.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
9.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
10.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
12.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
13.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
15.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
16.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
18.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
19.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
21.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
22.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
24.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
25.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
27.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
28.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
30.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
31.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
33.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
34.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
36.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
37.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
39.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
40.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
42.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
43.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
45.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0

Initial Supporting table - P2635 Threshold High

46.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0
48.0	30.0	37.5	45.0	52.5	60.0	67.5	75.0	82.5	90.0

Initial Supporting table - P2635 Threshold Low

Description: P2635 Filtered Pressure Error Low Threshold [over-performing pump]
Instantaneously calculated filtered fuel pressure error

Value Units: kilopascals
X Unit: kilopascals [desired fuel pressure]
Y Units: grams / second [fuel flow]

y/x	200.0	250.0	300.0	350.0	400.0	450.0	500.0	550.0	600.0
0.0	-260.0	-210.0	-160.0	-110.0	-60.0	-67.5	-75.0	-82.5	-90.0
1.5	-145.0	-125.0	-102.5	-81.3	-60.0	-67.5	-75.0	-82.5	-90.0
3.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
4.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
6.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
7.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
9.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
10.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
12.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
13.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
15.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
16.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
18.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
19.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
21.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
22.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
24.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
25.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
27.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
28.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
30.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
31.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
33.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
34.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
36.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
37.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
39.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
40.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
42.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
43.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
45.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0

Initial Supporting table - P2635 Threshold Low

46.5	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0
48.0	-30.0	-37.5	-45.0	-52.5	-60.0	-67.5	-75.0	-82.5	-90.0

Initial Supporting table - Pair_SCD_Decel

Description: Used for P0300 - P0308, Mulitplier to SCD_Decel to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
8	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
10	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
18	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
24	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
30	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
40	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
60	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
77	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

Initial Supporting table - Pair_SCD_Jerk

Description: Used for P0300 - P0308, Mulitplier to P0300_SCD_Jerk to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
77	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - PairCylModeDecel

Description: Used for P0300 - P0308, Mulitplier to Cyl Mode Deceleration to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: mulitplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	0.94	0.71	0.93	0.98	1.01	0.85	0.89	1.01	1.25	1.18	1.36	1.62	1.00	0.68	0.44	0.40	0.86
8	0.93	0.63	0.94	0.86	1.05	0.92	0.86	1.07	1.25	1.16	1.17	0.93	1.03	0.74	0.44	0.40	1.10
10	0.90	0.65	0.94	0.92	1.04	0.90	0.91	1.29	1.08	0.96	1.01	0.91	1.00	0.63	0.33	0.40	1.15
18	0.78	0.64	0.68	0.78	0.72	0.73	0.77	0.78	0.84	0.91	0.69	0.87	0.79	0.89	0.61	1.00	1.33
24	0.71	0.71	0.63	0.84	0.90	0.65	0.64	0.54	0.73	0.82	0.73	0.74	0.79	0.92	0.82	1.00	1.25
30	0.73	0.76	0.59	0.80	0.83	0.65	0.60	0.52	0.78	0.72	0.65	0.77	0.72	0.76	0.83	0.80	1.93
40	0.85	0.75	0.65	0.75	0.79	0.60	0.53	0.51	0.66	0.50	0.59	0.79	0.68	0.68	0.74	0.57	1.70
60	0.86	0.77	0.67	0.70	0.74	0.51	0.47	0.51	0.53	0.42	0.51	0.56	0.60	0.54	0.67	0.62	1.42
77	0.81	0.76	0.67	0.67	0.69	0.51	0.43	0.48	0.46	0.38	0.47	0.51	0.58	0.48	0.66	0.50	1.42

Initial Supporting table - PairCylModeJerk

Description: Used for P0300 - P0308, Mulitplier to P0300_CylModeJerk to account for different pattern of Paired cylinder misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	0.81	0.82	1.00	1.02	1.20	1.05	1.33	1.33	0.68	1.14	1.00	1.34	1.29	0.72	0.39	0.31	0.86
8	0.73	0.96	1.20	1.00	1.02	1.10	1.38	1.53	1.16	1.50	1.00	1.34	1.16	0.72	0.44	0.23	1.10
10	0.80	0.96	1.18	1.15	1.23	1.17	1.25	1.75	1.39	1.64	1.04	1.39	1.13	0.78	0.39	0.23	1.15
18	0.49	0.59	0.87	0.99	0.94	0.98	1.08	1.15	1.49	1.65	0.91	1.15	1.10	1.41	0.89	0.62	1.33
24	0.51	0.85	0.81	0.75	1.17	0.76	0.85	1.21	1.36	1.33	0.96	0.96	1.16	1.48	1.69	1.08	1.25
30	0.53	0.86	0.82	0.73	0.74	0.67	0.74	1.25	1.12	1.10	1.02	1.19	1.68	0.90	1.33	1.20	1.93
40	0.54	0.82	0.81	0.71	0.69	0.61	0.69	1.15	1.01	0.87	0.89	1.21	1.30	1.06	1.19	1.30	1.70
60	0.60	0.82	0.79	0.70	0.72	0.59	0.64	0.98	0.75	0.56	0.41	0.55	0.89	0.55	0.83	0.78	1.42
77	0.43	0.78	0.75	0.68	0.71	0.59	0.65	0.91	0.68	0.51	0.36	0.51	0.75	0.46	0.67	0.54	1.42

Initial Supporting table - Random_SCD_Decel

Description: Used for P0300 - P0308, Mulitplier to SCD_Decel to account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
8	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
18	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
24	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
30	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
40	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
60	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
77	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Initial Supporting table - Random_SCD_Jerk

Description: Used for P0300 - P0308, Mulitplier to Random_SCD_Jerk to account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	1,000	1,200	1,600	2,000
6	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
8	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
18	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
24	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
30	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
40	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
60	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
77	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Initial Supporting table - RandomAFM_Decl

Description: Used for P0300 - P0308, Mulitplier to Cylinder_Decel while in Cylnder Deactivation mode to account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
77	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - RandomAFM_Jerk

Description: Used for P0300 - P0308, Mulitplier to Cylinder_Jerk while in Cylnder Deactivation mode to account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,000	1,200	1,400	1,600	1,800	2,200	2,400	2,600	2,800
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
77	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - RandomCylModDecel

Description: Used for P0300 - P0308. Multiplier to CylMode_Decel.   account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: Multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	1.00	1.00	1.00	1.00	1.01	1.04	1.00	1.00	1.02	1.00	1.06	1.00	1.00	1.00	1.00	1.00	1.00
8	1.00	1.00	1.00	1.00	1.10	1.00	1.00	1.04	1.02	1.00	1.10	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	1.00	1.00	1.00	1.10	1.00	1.12	1.09	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00	1.10	1.10	1.12	1.00	1.07	1.00	1.03	1.07	1.11	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00	1.10	1.10	1.12	1.00	1.07	1.07	1.06	1.07	1.11	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00	1.10	1.10	1.12	1.00	1.07	1.09	1.06	1.07	1.11	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00	1.10	1.10	1.12	1.00	1.07	1.09	1.06	1.07	1.11	1.00	1.00	1.00	1.10
60	1.00	1.00	1.00	1.00	1.10	1.10	1.12	1.00	1.07	1.09	1.06	1.07	1.11	1.00	1.00	1.00	1.10
77	1.00	1.00	1.00	1.00	1.10	1.10	1.12	1.00	1.07	1.09	1.06	1.07	1.11	1.00	1.00	1.00	1.10

Initial Supporting table - RandomCylModJerk

Description: Used for P0300 - P0308, Multiplier to CylMode_Jerk to account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	500	600	700	800	900	1,000	1,100	1,200	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000	7,000
6	1.00	1.04	1.00	1.03	1.06	1.00	1.00	1.00	1.01	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	1.00	1.00	1.06	1.02	1.06	1.06	1.04	1.07	1.03	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	1.01	1.00	1.01	1.06	1.09	1.12	1.09	1.03	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	1.00	1.01	1.00	1.01	1.06	1.09	1.07	1.00	1.00	1.03	1.12	1.00	1.10	1.11	1.00	1.00	1.00
24	1.00	1.01	1.00	1.01	1.06	1.09	1.12	1.00	1.11	1.03	1.12	1.00	1.10	1.11	1.00	1.00	1.00
30	1.00	1.01	1.00	1.01	1.06	1.09	1.12	1.00	1.11	1.03	1.12	1.00	1.10	1.11	1.00	1.00	1.00
40	1.00	1.01	1.00	1.01	1.06	1.09	1.12	1.00	1.11	1.03	1.12	1.00	1.10	1.11	1.00	1.00	1.00
60	1.00	1.01	1.00	1.01	1.06	1.09	1.12	1.00	1.11	1.03	1.12	1.00	1.10	1.11	1.00	1.00	1.00
77	1.00	1.01	1.00	1.01	1.06	1.09	1.12	1.00	1.11	1.03	1.12	1.00	1.10	1.11	1.00	1.00	1.00

Initial Supporting table - RandomRevModDecl

Description: Used for P0300 - P0308, Mulitplier to RevMode_Decel to account for different pattern of light level misfire. Multipliers are a function of engine rpm and % engine Load.

Value Units: multiplier
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	3,000	3,500	4,000	4,500	5,000	5,500	6,000	7,000	8,000
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
77	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - RepetSnapDecayAdjst

Description: Used for P0300 - P0308, If misfire is present in consecutive engine cycles, this multiplier is applied to the misfire jerk threshold and compared to a crankshaft snap value after the misfire has taken place.. Table lookup as a function of engine rpm.

Value Units: multiplier
X Unit: RPM

y/x	1,000	1,200	1,600	2,000	2,600	3,500	4,500	5,500	6,500
1	1.40	1.30	1.20	1.20	1.20	1.20	1.20	1.20	1.20

Initial Supporting table - RevMode_Decel

Description: Used for P0300-P0308. Crankshaft decel threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Delta time between revolutions (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,100	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	21	30	31	22	26	29
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	19	30	31	22	26	29
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	24	32	31	22	26	29
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	34	31	31	22	26	29
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	36	33	32	22	26	29
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	35	35	33	23	26	29
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	43	42	36	26	31	29
40	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	56	58	41	37	40	36
60	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	78	83	54	62	50	46
78	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	109	107	72	69	66	61
97	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	166	140	122	114	106	100

Initial Supporting table - Ring Filter

Description: Used for P0300-P0308. Driveline Ring Filter
After a low level misfire, another misfire may not be detectable until driveline ringing ceases. If no ringing seen, stop filter early.

Value Units: Number of Engine cycles after isolated misfire (Engine cycles)
X Unit: thousands of RPM (rpm/1000)

y/x	0	1	2	3	4	5	6	7	8
1	4	4	4	4	4	4	4	4	4

Initial Supporting table - SCD_Decel

Description: Used for P0300-P0308 Crankshaft decel threshold. SCD mode uses smaller windows near TDC. Thresholds are a function of rpm and % engine Load.

Value Units: Delta time per cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	5,423	5,328	2,362	1,589	1,425	660	713	380	380	285	143	119	76
6	5,543	5,448	2,313	1,249	1,360	540	713	470	380	285	176	114	70
8	5,649	5,554	2,419	1,220	1,115	611	713	642	380	241	187	122	80
10	5,755	5,660	2,470	1,297	919	659	658	642	263	218	107	107	95
12	5,861	5,766	2,962	1,470	1,085	814	569	642	249	179	189	80	69
14	5,967	5,872	3,338	1,668	1,260	969	604	444	332	198	145	83	65
16	6,073	5,978	3,400	1,880	1,429	1,124	705	514	377	291	139	94	73
18	6,179	6,084	3,559	2,109	1,601	1,279	799	584	394	270	163	107	82
20	6,720	6,190	3,856	2,390	1,772	1,435	958	724	423	273	199	130	97
22	7,266	6,295	4,611	2,533	1,936	1,589	1,035	793	493	342	248	157	111
24	7,813	6,728	4,750	2,789	2,106	1,745	1,136	835	525	375	277	178	131
26	8,267	7,206	4,804	3,028	2,275	1,947	1,170	888	576	404	294	189	144
30	8,861	7,956	5,336	3,417	2,614	2,210	1,367	1,052	692	472	343	216	168
40	9,477	9,477	6,817	4,248	3,460	2,986	1,861	1,357	1,046	689	480	339	242
60	9,477	9,477	9,448	6,191	5,153	4,537	2,848	2,059	1,446	872	766	573	410
78	9,477	9,477	9,477	7,892	6,634	5,817	3,712	2,673	1,895	1,170	888	619	427
97	11,164	10,149	9,477	9,477	8,014	6,650	4,518	3,246	2,312	1,568	1,087	759	523

Initial Supporting table - SCD_Jerk

Description: Used for P0300-P0308. Crankshaft jerk threshold. SCD mode uses smaller windows near TDC. Thresholds are a function of rpm and % engine Load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	5,803	5,708	2,850	1,498	1,330	643	689	357	380	285	171	114	76
6	5,923	5,828	2,850	1,241	1,297	587	689	447	380	285	171	86	70
8	6,029	5,934	2,894	1,160	1,115	611	700	486	380	241	136	90	66
10	6,135	6,040	2,945	1,297	906	584	658	360	274	218	98	82	74
12	6,241	6,146	3,011	1,521	1,013	689	552	413	252	189	110	83	66
14	6,347	6,252	3,194	1,735	1,260	825	599	444	332	200	130	94	71
16	6,453	6,358	3,405	1,976	1,430	961	670	515	362	209	150	101	84
18	6,559	6,464	3,437	2,192	1,600	1,097	859	632	430	286	179	115	91
20	6,720	6,570	3,910	2,397	1,770	1,294	965	768	512	315	212	142	106
22	7,266	6,675	4,191	2,543	1,939	1,385	1,070	827	596	396	284	179	123
24	7,813	6,763	4,750	2,694	2,109	1,509	1,127	885	640	445	317	191	137
26	8,267	6,816	4,750	2,929	2,327	1,640	1,100	904	677	487	342	194	146
30	8,861	7,400	4,914	3,417	2,619	1,911	1,287	1,005	796	562	387	218	168
40	9,477	9,477	6,321	4,248	3,468	2,590	1,755	1,357	1,172	820	527	349	257
60	9,477	9,477	9,477	6,191	5,166	3,948	2,692	2,059	1,688	1,075	796	528	409
78	9,477	9,477	9,477	7,892	6,652	5,135	3,540	2,700	2,216	1,411	942	594	453
97	11,164	10,149	9,477	9,477	8,037	6,243	4,465	3,420	2,707	1,725	1,151	726	554

Initial Supporting table - SnapDecayAfterMisfire

Description: Used for P0300 - P0308, multiplier times the ddt_jerk value used used to detect misfire at that speed and load to see if size of disturbance has died down as expected of real misfire. Table lookup as a function of engine rpm and trans gear ratio.

Value Units: multiplier
X Unit: RPM
Y Units: gear ratio

y/x	1,000	1,200	1,600	2,000	2,600	3,500	4,500	5,500	6,500
0	1.12	1.40	1.45	1.18	0.91	0.75	0.75	0.75	0.75
1	1.12	1.40	1.45	1.18	0.91	0.75	0.75	0.75	0.75
1	1.12	1.40	1.45	1.18	0.91	0.75	0.75	0.75	0.75
1	1.23	1.49	1.48	1.19	0.96	1.04	1.04	1.04	1.04
1	1.35	1.55	1.43	1.24	1.02	1.22	1.22	1.29	1.29
2	1.26	1.47	1.46	1.27	1.24	1.50	1.50	1.50	1.50
2	1.11	1.27	1.31	1.37	1.54	1.63	1.63	1.63	1.63
4	1.25	1.30	1.27	1.29	1.25	1.42	1.42	1.42	1.42
8	1.25	1.30	1.27	1.29	1.25	1.42	1.42	1.42	1.42

Initial Supporting table - TOSSRoughRoadThres

Description: Used for P0300-P0308. Only used if Rough Road source = TOSS: dispersion value on Transmission Output Speed Sensor above which rough road is indicated present

Value Units: change in rpm per sec (rpm)
X Unit: Engine Speed (RPM)
Y Units: Transmission Speed (RPM)

y/x	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000
100	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
300	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
500	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
700	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
900	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,100	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,300	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - WaitToStart

Description: Used for P0300-P0308. Number of engine cycles to delay if diesel engine is cranked before wait to start lamp is extinguished. This lookup table determines the delay length by taking into account the coolant temperature.

Value Units: Number of Engine Cycles (integer)
X Unit: Engine Coolant (deg C)

y/x	-20	-10	0	10	20	30	40	50	60
1	0	0	0	0	0	0	0	0	0

Initial Supporting table - WSSRoughRoadThres

Description: Used for P0300-P0308. Only used if Wheel speed from ABS is used. If difference between wheel speed readings is larger than this limit, rough road is present

Value Units: acceleration
X Unit: Vehicle Speed (KPH)

y/x	0	12	24	36	48	60	72	85	97	109	121	133	145	157	169	181	193
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Initial Supporting table -ZeroTorqueAFM

Description: Used for P0300-P0308. Zero torque engine load while in Active Fuel Management. %of Max Brake Torque along the Neutral rev line, as a function of RPM and Baro

Value Units: Percent of Maximum Brake torque (%)
X Unit: RPM
Y Units: Barometric Pressure (kPa)

ZeroTorqueAFM - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
65	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
75	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
85	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
95	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
105	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90

ZeroTorqueAFM - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
65	1.90	1.90	1.90	1.90	1.90	1.90	1.90	3.28	4.71	6.13	7.56	8.99	10.42
75	1.90	1.90	1.90	1.90	1.90	1.90	1.90	3.28	4.71	6.13	7.56	8.99	10.42
85	1.90	1.90	1.90	1.90	1.90	1.90	1.90	3.28	4.71	6.13	7.56	8.99	10.42
95	1.90	1.90	1.90	1.90	1.90	1.90	1.90	3.28	4.71	6.13	7.56	8.99	10.42
105	1.90	1.90	1.90	1.90	1.90	1.90	1.90	3.28	4.71	6.13	7.56	8.99	10.42

Initial Supporting table -ZeroTorqueEngLoad

Description: Used for P0300-P0308. %of Max Brake Torque that represents Zero Brake torque along the Neutral rev line, as a function of RPM and Baro

Value Units: Percent of Maximum Brake torque (%)
X Unit: RPM
Y Units: Barometric Pressure (kPa)

ZeroTorqueEngLoad - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
65	-2.70	-2.70	-2.70	-2.70	-2.25	-1.80	-1.20	0.10	0.80	0.65	0.25	-0.15	-0.60
75	-2.70	-2.70	-2.70	-2.70	-2.25	-1.80	-1.20	0.10	0.80	0.65	0.25	-0.15	-0.60
85	-2.70	-2.70	-2.70	-2.70	-2.25	-1.80	-1.20	0.10	0.80	0.65	0.25	-0.15	-0.60
95	-2.70	-2.70	-2.70	-2.70	-2.25	-1.80	-1.20	0.10	0.80	0.65	0.25	-0.15	-0.60
105	-2.70	-2.70	-2.70	-2.70	-2.25	-1.80	-1.20	0.10	0.80	0.65	0.25	-0.15	-0.60

ZeroTorqueEngLoad - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
65	-1.00	-1.20	-1.20	-1.20	-1.00	1.70	4.25	6.80	9.35	11.90	14.45	17.00	19.55
75	-1.00	-1.20	-1.20	-1.20	-1.00	1.70	4.25	6.80	9.35	11.90	14.45	17.00	19.55
85	-1.00	-1.20	-1.20	-1.20	-1.00	1.70	4.25	6.80	9.35	11.90	14.45	17.00	19.55
95	-1.00	-1.20	-1.20	-1.20	-1.00	1.70	4.25	6.80	9.35	11.90	14.45	17.00	19.55
105	-1.00	-1.20	-1.20	-1.20	-1.00	1.70	4.25	6.80	9.35	11.90	14.45	17.00	19.55

Initial Supporting table - P0324_PerCyl_ExcessiveKnock_Threshold

Description: Fail threshold for the Knock Performance per-cylinder Excessive Knock Diagnostic

Value Units: Filtered Knock Intensity. Unit-less term scaled from 0.0 (no knock) to 5.0 (maximum/large knock)
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Initial Supporting table - P0325_P0330_OpenCktThrshMax (20 kHz)

Description: Knock Open Circuit Diagnostic Maximum Threshold when using the 20 kHz method (see "OpenMethod" description)

Value Units: Unit-less, filtered term from the Knock Detection Fast Fourier Transform (FFT) for the 20 kHz frequency range.
X Unit: Engine Speed (RPM).
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	2.8008	2.8281	2.8242	2.8203	2.8242	2.8281	2.8242	2.8242	2.8262	2.5605	2.5605	2.5605	2.5605	2.5605	2.5605	2.5605	2.5605

Initial Supporting table - P0325_P0330_OpenCktThrshMax (Normal Noise)

Description: Knock Open Circuit Diagnostic Minimum Threshold when using the Normal Noise method (see "OpenMethod" description): When using the Normal Noise method (see "OpenMethod" description).

Value Units: Filtered background engine noise. Unit-less term from the Knock Detection Fast Fourier Transform (FFT) for a selected frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	2,700	2,900	3,000	3,250	3,500	3,750	4,000	4,250	4,500	4,750	5,000	5,500	6,000	6,500	7,000	7,500	8,500
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Initial Supporting table - P0325_P0330_OpenCktThrshMin (20 kHz)

Description: Knock Open Circuit Diagnostic Minimum Threshold when using the 20 kHz method (see "OpenMethod" description)

Value Units: Unit-less, filtered term from the Knock Detection Fast Fourier Transform (FFT) for the 20 kHz frequency range.
X Unit: Engine (RPM)
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	0.8691	0.8691	0.9375	0.8691	0.8809	0.8594	0.8711	0.8535	0.8496	0.7656	0.7695	0.7695	0.7695	0.7695	0.7695	0.7695	0.7695

Initial Supporting table - P0325_P0330_OpenCktThrshMin (Normal Noise)

Description: Knock Open Circuit Diagnostic Minimum Threshold when using the Normal Noise method (see "OpenMethod" description): When using the Normal Noise method (see "OpenMethod" description).

Value Units: Filtered background engine noise. Unit-less term from the Knock Detection Fast Fourier Transform (FFT) for a selected frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	2,700	2,900	3,000	3,250	3,500	3,750	4,000	4,250	4,500	4,750	5,000	5,500	6,000	6,500	7,000	7,500	8,500
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Initial Supporting table -P0325_P0330_OpenMethod_2

Description: Defines which Knock Open Circuit Diagnostic method to use.

Value Units: Identifies one of two diagnostic methods (either 20 kHz or Normal Noise) used (as a function of engine speed) for Open Circuit detection
X Unit: Engine Speed Index, 500 to 8500 (RPM) by 500 rpm increments (Index 0, 1, 2.... 16 = 500, 1000, 1500.... 8500 RPM)
Y Units: N/A

P0325_P0330_OpenMethod_2 - Part 1

y/x	0	1	2	3	4
1	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz

P0325_P0330_OpenMethod_2 - Part 2

y/x	5	6	7	8	9
1	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz

P0325_P0330_OpenMethod_2 - Part 3

y/x	10	11	12	13	14
1	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz

P0325_P0330_OpenMethod_2 - Part 4

y/x	15	16			
1	CeKNKD_e_Open_20KHz	CeKNKD_e_Open_20KHz			

Initial Supporting table - P0326_P0331_AbnormalNoise_CylsEnabled

Description: Specifies which cylinders will be used for the Abnormal Noise portion of the performance diagnostics (1 = cylinder used, 0 = cylinder not used)

Value Units: Boolean that indicates which engine cylinders are being used for the per-sensor Knock Performance diagnostic (0 = not used, 1 = used)
X Unit: Cylinder number in firing order (i.e. Cyl 0 = first cylinder in firing order, Cyl 1 = second cylinder in firing order....)
Y Units: N/A

y/x	0	1	2	3	4	5	6	7
1	1	1	1	1	1	1	0	0

Initial Supporting table - P0326_P0331_AbnormalNoise_Threshold

Description: Fail threshold for the Knock Performance Abnormal Noise Diagnostic when engine is NOT in AFM mode

Value Units: Filtered background engine noise. Unit-less term from the Knock Detection Fast Fourier Transform (FFT) for a selected frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	1.000	1.000	0.843	0.625	0.546	0.382	0.293	0.319	0.272	0.282	0.280	0.280	0.280	0.280	0.280	0.280	0.280

Initial Supporting table - P06B6_P06B7_OpenTestCktThrshMax

Description: Knock Open Circuit Minimum Threshold for Internal Circuit Diagnostic. Used only when the 20 kHz method is being used (see "OpenMethod" description). The Open Test Circuit ensures that the internal circuit used to generate the 20 kHz signal for the Open Circuit diags (P0325, P0330) is within range.

Value Units: Unit-less, filtered term from the Knock Detection Fast Fourier Transform (FFT) for the 20 kHz frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	0.045	0.043	0.045	0.047	0.049	0.055	0.063	0.066	0.072	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090

Initial Supporting table - P06B6_P06B7_OpenTestCktThrshMin

Description: Knock Open Circuit Minimum Threshold for Internal Circuit Diagnostic. Used only when the 20 kHz method is being used (see "OpenMethod" description). The Open Test Circuit ensures that the internal circuit used to generate the 20 kHz signal for the Open Circuit diags (P0325, P0330) is within range.

Value Units: Unit-less, filtered term from the Knock Detection Fast Fourier Transform (FFT) for the 20 kHz frequency range.
X Unit: Engine Speed (RPM).
Y Units: N/A

y/x	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	0.020	0.020	0.020	0.020	0.021	0.023	0.027	0.031	0.031	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041

Initial Supporting table - P0016, P0017, P0018, P0019: Cam Correlation Oil Temperature Threshold

Description: P0016, P0017, P0018, P0019: Cam Correlation Oil Temperature Threshold

Value Units: Engine Run Time- Seconds
X Unit: Oil Temperature- C

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300	300	160	18	18	18	18	10	3	3	3	3	3	3	3	3	3

Initial Supporting table - P2160 range change delay time

Description: If the transmission range state changes, the transmission range state must be stable for this amount of time as part of the P2160 enable conditions.

X Unit: transmission fluid temperature DegC
Y Units: delay time seconds

y/x	-40.00	0.00	40.00
1	5.000	5.000	5.000

Initial Supporting table - P2161 range change delay time

Description: If the transmission range state changes, the transmission range state must be stable for this amount of time as part of the P2161 enable conditions.

X Unit: transmission fluid temperature DegC
Y Units: delay time seconds

y/x	-40.00	-20.00	40.00
1	5.000	5.000	5.000

Initial Supporting table - P279A P279B P279C Transfer Case Control Module Transfer Case Command State Rationality (weighting factor)

Description: KtFWDD_Cnt_SampleWeigthting: Calibration table that defines the weighting factor used in a sample of the measured transfer case ratio for full range diagnostics, based on vehicle speed and axle torque. Table vertical axis is engine torque (Nm), horizontal axis is vehicle speed (KPH) and table output is the weighted fail count (counts).

Value Units: counts
X Unit: KPH
Y Units: Nm

y/x	0.00	3.00	5.00	5.10	12.00	15.00	18.00	21.00	24.00
-200.00	0	0	0	0	0	0	0	0	0
-150.00	0	0	0	0	0	0	0	0	0
-100.00	0	0	0	0	0	0	0	0	0
-50.00	0	0	0	0	0	0	0	0	0
0.00	0	0	0	0	0	0	0	0	0
50.00	0	0	0	0	0	0	0	0	0
100.00	0	0	0	0	0	0	0	0	0
150.00	0	0	0	0	0	0	0	0	0
200.00	0	0	0	0	0	0	0	0	0

Initial Supporting table - P279A Transfer Case Control Module Transfer Case Command State Rationality (margin of error high)

Description: LeFWDD_r_RatioHiBound_P279A = KeFWDD_r_TCaseHiRange + KtFWDD_r_TCaseHiRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
2.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
3.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
4.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
5.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
6.00	8.9999	8.9999	8.9999	8.9999	1.3000	1.3000	1.3000	1.3000	1.3000
7.00	8.9999	8.9999	8.9999	8.9999	1.3000	1.3000	1.3000	1.3000	1.3000
8.00	8.9999	8.9999	8.9999	8.9999	1.3000	1.3000	1.3000	1.3000	1.3000
9.00	8.9999	8.9999	8.9999	8.9999	1.3000	1.3000	1.3000	1.3000	1.3000

Initial Supporting table - P279A Transfer Case Control Module Transfer Case Command State Rationality (margin of error low)

Description: LeFWDD_r_RatioLoBound_P279A = KeFWDD_r_TCaseHiRange - KtFWDD_r_TCaseHiRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1	2	3	4	5	6	7	8	9
1	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00
2	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00
3	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00
4	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00
5	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00
6	-7.00	-7.00	-7.00	-7.00	0.70	0.70	0.70	0.70	0.70
7	-7.00	-7.00	-7.00	-7.00	0.70	0.70	0.70	0.70	0.70
8	-7.00	-7.00	-7.00	-7.00	0.70	0.70	0.70	0.70	0.70
9	-7.00	-7.00	-7.00	-7.00	0.70	0.70	0.70	0.70	0.70

Initial Supporting table - P279B Transfer Case Control Module Transfer Case Command State Rationality (margin of error high)

Description: LeFWDD_r_RatioHiBound_P279B = KeFWDD_r_TCaseLoRange + KtFWDD_r_TCaseLoRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
2.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
3.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
4.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
5.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
6.00	10.7098	10.7098	10.7098	10.7098	3.0100	3.0100	3.0100	3.0100	3.0100
7.00	10.7098	10.7098	10.7098	10.7098	3.0100	3.0100	3.0100	3.0100	3.0100
8.00	10.7098	10.7098	10.7098	10.7098	3.0100	3.0100	3.0100	3.0100	3.0100
9.00	10.7098	10.7098	10.7098	10.7098	3.0100	3.0100	3.0100	3.0100	3.0100

Initial Supporting table - P279B Transfer Case Control Module Transfer Case Command State Rationality (margin of error low)

Description: LeFWDD_r_RatioLoBound_P279B = KeFWDD_r_TCaseLoRange - KtFWDD_r_TCaseLoRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
2.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
3.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
4.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
5.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
6.00	-5.2899	-5.2899	-5.2899	-5.2899	2.4099	2.4099	2.4099	2.4099	2.4099
7.00	-5.2899	-5.2899	-5.2899	-5.2899	2.4099	2.4099	2.4099	2.4099	2.4099
8.00	-5.2899	-5.2899	-5.2899	-5.2899	2.4099	2.4099	2.4099	2.4099	2.4099
9.00	-5.2899	-5.2899	-5.2899	-5.2899	2.4099	2.4099	2.4099	2.4099	2.4099

Initial Supporting table - P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error high 1)

Description: LeFWDD_r_RatioHiBound1_P279C = KeFWDD_r_TCaseHiRange + KtFWDD_r_TCaseNeutRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
2.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
3.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
4.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
5.00	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999	8.9999
6.00	8.9999	8.9999	8.9999	8.9999	5.0000	5.0000	3.0000	3.0000	3.0000
7.00	8.9999	8.9999	8.9999	8.9999	3.0000	3.0000	2.0000	2.0000	2.0000
8.00	8.9999	8.9999	8.9999	8.9999	2.0000	2.0000	1.5000	1.5000	1.5000
9.00	8.9999	8.9999	8.9999	8.9999	1.1000	1.1000	1.1000	1.1000	1.1000

Initial Supporting table - P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error high 2)

Description: LeFWDD_r_RatioHiBound2_P279C = KeFWDD_r_TCaseLoRange + KtFWDD_r_TCaseNeutRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
2.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
3.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
4.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
5.00	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098	10.7098
6.00	10.7098	10.7098	10.7098	10.7098	6.7100	6.7100	4.7100	4.7100	4.7100
7.00	10.7098	10.7098	10.7098	10.7098	4.7100	4.7100	3.7100	3.7100	3.7100
8.00	10.7098	10.7098	10.7098	10.7098	3.7100	3.7100	3.2100	3.2100	3.2100
9.00	10.7098	10.7098	10.7098	10.7098	2.8099	2.8099	2.8099	2.8099	2.8099

Initial Supporting table - P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error low 1)

Description: LeFWDD_r_RatioLoBound1_P279C = KeFWDD_r_TCaseHiRange - KtFWDD_r_TCaseNeutRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999
2.00	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999
3.00	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999
4.00	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999
5.00	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999	-6.9999
6.00	-6.9999	-6.9999	-6.9999	-6.9999	-3.0000	-3.0000	-1.0000	-1.0000	-1.0000
7.00	-6.9999	-6.9999	-6.9999	-6.9999	-1.0000	-1.0000	0.0000	0.0000	0.0000
8.00	-6.9999	-6.9999	-6.9999	-6.9999	0.0000	0.0000	0.5000	0.5000	0.5000
9.00	-6.9999	-6.9999	-6.9999	-6.9999	0.9000	0.9000	0.9000	0.9000	0.9000

Initial Supporting table - P279C Transfer Case Control Module Transfer Case Command State Rationality (margin of error low 2)

Description: LeFWDD_r_RatioLoBound2_P279C = KeFWDD_r_TCaseLoRange - KtFWDD_r_TCaseNeutRatioMargin

Value Units: ratio
X Unit: KPH
Y Units: Nm

y/x	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
1.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
2.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
3.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
4.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
5.00	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899	-5.2899
6.00	-5.2899	-5.2899	-5.2899	-5.2899	-1.2900	-1.2900	0.7100	0.7100	0.7100
7.00	-5.2899	-5.2899	-5.2899	-5.2899	0.7100	0.7100	1.7100	1.7100	1.7100
8.00	-5.2899	-5.2899	-5.2899	-5.2899	1.7100	1.7100	2.2100	2.2100	2.2100
9.00	-5.2899	-5.2899	-5.2899	-5.2899	2.6100	2.6100	2.6100	2.6100	2.6100

Initial Supporting table - P0461 P2066 P2636 Transfer Pump Enable Time Table

Description: TransferPumpOnTimeLimit as a function of fuel level

Value Units: Transfer Pump On Time Limit (seconds)
X Unit: Fuel Level (percent)

P0461 P2066 P2636 Transfer Pump Enable Time Table - Part 1

y/x	0	3	6	9	13	16	19	22	25	28	31	34	38	41	44	47	50
1	0	450	450	450	450	450	450	450	450	506	563	619	675	731	788	844	900

P0461 P2066 P2636 Transfer Pump Enable Time Table - Part 2

y/x	53	56	59	63	66	69	72	75	78	81	84	88	91	94	97	100	
1	956	1,013	1,069	1,125	1,181	1,238	1,294	1,350	1,406	1,463	1,519	1,575	1,631	1,688	1,744	1,800	

Initial Supporting table - Multiple DTC Use - Response Cell Enable Table

Description: This table describes the Block learn cells which enable the Pre (Primary) Oxygen sensor response tests.
Note: When the table column heading matches the calibration value below it, that individual cell is enabled.

Value Units: Block Learn cell name and number
X Unit: Block Learn cell name and number

Multiple DTC Use - Response Cell Enable Table - Part 1

y/x	CeFADR_e_Cell00_PurgOnAirMode 5	CeFADR_e_Cell01_PurgOnAirMode 4	CeFADR_e_Cell02_PurgOnAirMode 3	CeFADR_e_Cell03_PurgOnAirMode 2
1	CeFADR_e_Cell00_PurgOnAirMode 5	CeFADR_e_Cell01_PurgOnAirMode 4	CeFADR_e_Cell02_PurgOnAirMode 3	CeFADR_e_Cell03_PurgOnAirMode 2

Multiple DTC Use - Response Cell Enable Table - Part 2

y/x	CeFADR_e_Cell04_PurgOnAirMode 1	CeFADR_e_Cell05_PurgOnAirMode 0	CeFADR_e_Cell06_PurgOnIdle	CeFADR_e_Cell07_PurgOnDecel
1	CeFADR_e_Cell04_PurgOnAirMode 1	CeFADR_e_Cell05_PurgOnAirMode 0	CeFADR_e_Cell06_PurgOnIdle	CeFADR_e_Cell07_PurgOnDecel

Multiple DTC Use - Response Cell Enable Table - Part 3

y/x	CeFADR_e_Cell08_PurgOffAirMode 5	CeFADR_e_Cell09_PurgOffAirMode 4	CeFADR_e_Cell10_PurgOffAirMode 3	CeFADR_e_Cell11_PurgOffAirMode 2
1	CeFADR_e_Cell08_PurgOffAirMode 5	CeFADR_e_Cell09_PurgOffAirMode 4	CeFADR_e_Cell10_PurgOffAirMode 3	CeFADR_e_Cell11_PurgOffAirMode 2

Multiple DTC Use - Response Cell Enable Table - Part 4

y/x	CeFADR_e_Cell12_PurgOffAirMode 1	CeFADR_e_Cell13_PurgOffAirMode 0	CeFADR_e_Cell14_PurgOffIdle	CeFADR_e_Cell15_PurgOffDecel
1	CeFADR_e_Cell12_PurgOffAirMode 1	CeFADR_e_Cell13_PurgOffAirMode 0	CeFADR_e_Cell14_PurgOffIdle	CeFADR_e_Cell15_PurgOffDecel

Initial Supporting table - Multiple DTC Use_Green Sensor Delay Criteria - Limit

Description: This Calibration is the acculmulated airflow limit above which the Green condition is expired
Used for: P0133, P013A, P013B, P013C, P013D, P013E, P013F, P014A, P014B, P0153, P015A, P015B, P015C, P015D, P1133, P1153, P2270, P2271, P2272 and P2273.
Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.

Value Units: Grams
X Unit: Acculmulated Engine Airflow

y/x	CiOXYR_O2_Bank1_Sensor1	CiOXYR_O2_Bank1_Sensor2	CiOXYR_O2_Bank2_Sensor1	CiOXYR_O2_Bank2_Sensor2
1	120,000	120,000	120,000	120,000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,500	4,000	4,500	5,000	5,500	6,500	7,500
1	0.850	0.850	0.850	0.850	0.850	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,500	4,000	4,500	5,000	5,500	6,500	7,500
1	0.850	0.850	0.850	0.850	0.850	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM

OBD GROUP: HGMXOBDG03 **TEST GROUP: HGMXT03.6152** **EMISSIONS STDS: CAL--ULEV125, FED--BIN125**

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP3 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	250	750	1,250	1,750	2,250	2,750	3,250	3,750	4,250	4,750	5,250	5,750	6,250	6,750	7,250	9,000
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 TPS Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,500	4,000	4,500	5,000	5,500	6,500	7,500
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P1101: Boost Residual Weight Factor based on % of Boost

Description: P0101_P0106_P0121_P012B_P1101 Boost Residual Weight Factor based on % of Boost

Value Units: Weight Factor (Unitless)
X Unit: Boost Percentage (%)

y/x	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P1101: SCIAP1 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P1101 SCIAP1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,500	4,000	4,500	5,000	5,500	6,500	7,500
1	0.850	0.850	0.850	0.850	0.850	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P1101: SCIAP2 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P1101 SCIAP2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,500	4,000	4,500	5,000	5,500	6,500	7,500
1	0.850	0.850	0.850	0.850	0.850	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix

Description: Supercharger Intake Flow Rationality Diagnostic Failure Matrix. This table describes combinations of individual model failures that will set P0101, P0106, P012B, P0121 and P1101 on supercharged applications.

Value Units: Boolean
X Unit: Unitless (See top line for heading information)
Y Units: Unitless

y/x	1	2	3	4	5	6	7
1	TPS Model Failure	MAF Model Failure	MAP1 Model Failure	MAP2 Model Failure	SCIAP1 Model Failure	SCIAP2 Model Failure	DTC Set
2	F	F	F	F	F	F	No DTC
3	F	F	F	F	F	T	No DTC
4	F	F	F	F	T	F	No DTC
5	F	F	F	F	T	T	P012B
6	F	F	F	T	F	F	No DTC
7	F	F	F	T	F	T	P1101
8	F	F	F	T	T	F	P1101
9	F	F	F	T	T	T	P1101
10	F	F	T	F	F	F	No DTC
11	F	F	T	F	F	T	P1101
12	F	F	T	F	T	F	P1101
13	F	F	T	F	T	T	P1101
14	F	F	T	T	F	F	P0106
15	F	F	T	T	F	T	P1101
16	F	F	T	T	T	F	P1101
17	F	F	T	T	T	T	P1101
18	F	T	F	F	F	F	No DTC
19	F	T	F	F	F	T	P0101
20	F	T	F	F	T	F	No DTC
21	F	T	F	F	T	T	P0101 & P012B
22	F	T	F	T	F	F	P1101
23	F	T	F	T	F	T	P0101
24	F	T	F	T	T	F	P1101
25	F	T	F	T	T	T	P0101 & P012B
26	F	T	T	F	F	F	P1101
27	F	T	T	F	F	T	P1101
28	F	T	T	F	T	F	P1101
29	F	T	T	F	T	T	P1101
30	F	T	T	T	F	F	P1101
31	F	T	T	T	F	T	P1101

Initial Supporting table - P0101, P0106, P0121, P012B, P1101: Supercharger Intake Flow Rationality Diagnostic Failure Matrix

32	F	T	T	T	T	F	P1101
33	F	T	T	T	T	T	P1101
34	T	F	F	F	F	F	P0121
35	T	F	F	F	F	T	No DTC
36	T	F	F	F	T	F	P0121
37	T	F	F	F	T	T	P1101
38	T	F	F	T	F	F	P1101
39	T	F	F	T	F	T	P1101
40	T	F	F	T	T	F	P1101
41	T	F	F	T	T	T	P1101
42	T	F	T	F	F	F	P0121
43	T	F	T	F	F	T	P1101
44	T	F	T	F	T	F	P0121
45	T	F	T	F	T	T	P1101
46	T	F	T	T	F	F	P1101
47	T	F	T	T	F	T	P1101
48	T	F	T	T	T	F	P1101
49	T	F	T	T	T	T	P1101
50	T	T	F	F	F	F	P0121
51	T	T	F	F	F	T	P1101
52	T	T	F	F	T	F	P0121
53	T	T	F	F	T	T	P1101
54	T	T	F	T	F	F	P1101
55	T	T	F	T	F	T	P1101
56	T	T	F	T	T	F	P1101
57	T	T	F	T	T	T	P1101
58	T	T	T	F	F	F	P0121
59	T	T	T	F	F	T	P1101
60	T	T	T	F	T	F	P0121
61	T	T	T	F	T	T	P1101
62	T	T	T	T	F	F	P1101
63	T	T	T	T	F	T	P1101
64	T	T	T	T	T	F	P1101
65	T	T	T	T	T	T	P1101

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P0236_P1101 TIAP Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,500
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0133_KnEOSD_t_ST_LRC_LimRS1

Description: X Table Axis for P0133

Value Units: Seconds
X Unit: X Table Axis for P0133, L2R Response time breakpoints for table

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0.000	0.030	0.045	0.060	0.075	0.090	0.105	0.120	0.135	0.150	0.165	0.180	0.195	0.210	0.225	0.240	1.000

Initial Supporting table - P0133_KnEOSD_t_ST_RLC_LimRS1

Description: Y Table Axis for P0133

Value Units: Seconds
Y Units: Y Table Axis for P0133, R2L Response time breakpoints for table

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0.000	0.045	0.060	0.075	0.090	0.105	0.120	0.135	0.150	0.165	0.180	0.195	0.210	0.225	0.240	0.255	1.000

Initial Supporting table - P0133_O2S Slow Response Bank 1 Sensor 1 Pass/Fail Threshold table

Description: This table discribes the Pass and Fail regions based on the diagnostic test result

Value Units: If the cell contains a "0" then the fault is indicated, if it contains a "1" a fault is not indicated.
X Unit: X axis is Lean to Rich response time (in sec), Please see the table below named "KnEOSD_t_ST_LRC_LimRS1" for the 17 X axis table breakpoints.
Y Units: Y axis is Rich to Lean response time (in sec), Please see the table below named "KnEOSD_t_ST_RLC_LimRS1" for the 17 Y axis table breakpoints.

y/x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Initial Supporting table - P0153_KnEOSD_t_ST_LRC_LimRS2

Description: X Table Axis for P0153

Value Units: Seconds
X Unit: X Table Axis for P0153, L2R Response time breakpoints for table

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0.000	0.030	0.045	0.060	0.075	0.090	0.105	0.120	0.135	0.150	0.165	0.180	0.195	0.210	0.225	0.240	1.000

Initial Supporting table - P0153_KnEOSD_t_ST_RLC_LimRS2

Description: Y Table Axis for P0153

Value Units: Seconds
Y Units: Y Table Axis for P0153, R2L Response time breakpoints for table

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0.000	0.045	0.060	0.075	0.090	0.105	0.120	0.135	0.150	0.165	0.180	0.195	0.210	0.225	0.240	0.255	1.000

Initial Supporting table - P0153_O2S Slow Response Bank 2 Sensor 1 Pass/Fail Threshold table

Description: This table discribes the Pass and Fail regions based on the diagnostic test result

Value Units: If the cell contains a "0" then the fault is indicated, if it contains a "1" a fault is not indicated.
X Unit: X axis is Lean to Rich response time (in sec), Please see the table below named "KnEOSD_t_ST_LRC_LimRS2" for the 17 X axis table breakpoints.
Y Units: Y axis is Rich to Lean response time (in sec), Please see the table below named "KnEOSD_t_ST_RLC_LimRS2" for the 17 Y axis table breakpoints.

y/x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on MAF Est

Value Units: Weight Factor (Unitless)
X Unit: Estimated Engine Air Flow (Grams/Second)

y/x	0	50	70	73	76	79	82	85	89	95	100	110	120	150	200	280	350
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	500	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,500	4,000	4,500	5,000	5,500	6,500	7,500
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0116_Fail if power up ECT exceeds IAT by these values

Description: KtECTD_T_HSC_FastFailTempDiff

Value Units: Fast Failure temp difference (°C)
X Unit: IAT Temperature at Power up (°C)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	80	80	80	60	60	40	40	30	30	30	30	30	30	30	30	30	30

Initial Supporting table - P0806 EngTorqueThreshold Table

Description: The diagnostic is inhibited if torque (NM) is less than this value. Prevents false fails in regions where false in-gear N/TOS ratios are possible due to low torque, where high torque would otherwise cause slip and prevent a valid in-gear state.

Value Units: Torque (NM)
X Unit: Percent Clutch Pedal Position (%)

y/x	0.00	6.25	12.50	18.75	25.00	31.25	37.50	43.75	50.00	56.25	62.50	68.75	75.00	81.25	87.50	93.75	100.00
1	50.0	50.0	50.0	53.0	59.0	69.0	83.0	106.0	125.0	130.0	-8,192.0	-8,192.0	-8,192.0	-8,192.0	-8,192.0	-8,192.0	-8,192.0

Initial Supporting table - P0806 ResidualErrEnableHigh Table

Description: Represents the upper threshold of a deadband where the diagnostic will be inhibited to prevent false fails due to clutch slip that can falsely indicate a valid in-gear N/TOS ratio. The lower threshold of the deadband is represented by the table "P0806 ResidualErrEnableLow Table". A lower threshold value that is greater than or equal to the upper threshold for the same gear is an indication that this portion of the diagnostic's enable critera is ignored in that gear. Conversely if the lower threshold value is at or near 0% and the upper threshold for the same gear is at or near 100%, then diagnosis is not enabled in that gear.

Value Units: Percent Clutch Pedal Position (%)
X Unit: Gear, where "0" - "6" is gear 1 - 7, respectively; "7" is reverse

y/x	0	1	2	3	4	5	6	7
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Initial Supporting table -P0806 ResidualErrEnableLow Table

Description: Represents the lower threshold of a deadband where the diagnostic will be inhibited to prevent false fails due to clutch slip that can falsely indicate a valid in-gear N/TOS ratio. The upper threshold of the deadband is represented by the table "P0806 ResidualErrEnableHigh Table". An upper threshold value that is less than or equal to the lower threshold for the same gear is an indication that this portion of the diagnostic's enable critera is ignored in that gear. Conversely if the lower threshold value is at or near 0% and the upper threshold for the same gear is at or near 100%, then diagnosis is not enabled in that gear.

Value Units: Percent Clutch Pedal Position (%)
X Unit: Gear, where "0" - "6" is gear 1 - 7, respectively; "7" is reverse

y/x	0	1	2	3	4	5	6	7
1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A max area A)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	15.00	19.00	23.00	27.00	31.00
1.0	36.00	36.00	36.00	36.00	36.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A max area B)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	15.00	19.00	23.00	27.00	31.00
1.0	54.00	54.00	54.00	54.00	54.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A max area C)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	15.00	19.00	23.00	27.00	31.00
1.0	72.00	72.00	72.00	72.00	72.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A max area D)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	64.00	68.00	72.00	76.00	80.00
1.0	34.00	35.70	35.70	36.70	36.70

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A max area E)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	64.00	68.00	72.00	76.00	80.00
1.0	51.40	53.00	54.00	55.00	55.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A max area F)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	64.00	68.00	72.00	76.00	80.00
1.0	69.00	71.50	73.00	74.00	74.30

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A min area A)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	15.00	19.00	23.00	27.00	31.00
1.0	32.00	32.50	33.00	33.50	34.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A min area B)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	15.00	19.00	23.00	27.00	31.00
1.0	51.00	51.00	51.50	51.50	53.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A min area C)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	15.00	19.00	23.00	27.00	31.00
1.0	67.00	67.00	68.00	68.50	69.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A min area D)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	64.00	68.00	72.00	76.00	80.00
1.0	31.50	31.00	30.50	30.50	30.50

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A min area E)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	64.00	68.00	72.00	76.00	80.00
1.0	50.00	50.00	50.00	50.00	50.00

Initial Supporting table - P18C8 Gear position sensor range/performance (sensor A min area F)

Description: Sensor A threshold values that define the invalid areas (between shifter gates) for the P18C8 diagnostic. Thresholds are a function of Gear Position Sensor B.

Value Units: PWM % duty cycle
X Unit: PWM % duty cycle

y/x	64.00	68.00	72.00	76.00	80.00
1.0	68.00	68.00	68.00	68.00	68.00

Initial Supporting table - Multiple DTC Use_Green Sensor Delay Criteria - Limit

Description: This Calibration is the acculmulated airflow limit above which the Green condition is expired
Used for: P0133, P013A, P013B, P013C, P013D, P013E, P013F, P014A, P014B, P0153, P015A, P015B, P015C, P015D, P1133, P1153, P2270, P2271, P2272 and P2273.
Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.

Value Units: Grams
X Unit: Acculmulated Engine Airflow

y/x	CiOXYR_O2_Bank1_Sensor1	CiOXYR_O2_Bank1_Sensor2	CiOXYR_O2_Bank2_Sensor1	CiOXYR_O2_Bank2_Sensor2
1	120,000	120,000	120,000	120,000

Initial Supporting table - P0011_P0021_P05CC_P05CD_EngOilPressEnblIc

Description: Delay time before the oil pressure enable flag is set assuming all the oil pressure enable criteria are met

Value Units: Time (sec)
X Unit: Engine Coolant Temperature (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	6	6	6	4	4	3	3	2	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0011_P0021_P05CC_P05CD_HiEngSpdHiDsblIc

Description: Minimum engine speed to disable Intake cam

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000

Initial Supporting table - P0011_P0021_P05CC_P05CD_HiEngSpdLoEnblIc

Description: Maximum engine speed to enable Intake cam - works as hysteresis.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoPresHiEnblIc

Description: Intake cam is enabled when oil pressure exceeds this value

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoPresLoDsblIc

Description: Intake cam is disabled when oil pressure falls below this value

Value Units: Engine Oil Pressure (kPa)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoRpmHiEnblIc

Description: Intake cam is enabled when engine speed exceeds this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	400	400	400	400	450	450	450	450	450	450	450	450	450	1,200	1,400	1,650	7,600

Initial Supporting table - P0011_P0021_P05CC_P05CD_LoRpmLoDsblIc

Description: Intake cam is disabled when engine speed is below this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300	300	300	300	350	350	350	350	350	350	350	350	350	1,100	1,300	1,550	7,500

Initial Supporting table - P0011_P0021_P05CC_P05CD_P0014_P0024_P05CE_P05CF_ColdStartEngRunning

Description: Engine running time must be greater than this threshold during a cold start to enable cam phasing

Value Units: Time (sec)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	24	24	18	4	4	3	3	3	3	3	3	2	2	2	2	2	2

Initial Supporting table - P0014_P0024_P05CE_P05CF_EngOilPressEnblEc

Description: Delay time before the oil pressure enable flag is set assuming all the oil pressure enable criteria are met

Value Units: Time (sec)
X Unit: Engine Coolant Temperature (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	6	6	6	4	4	3	3	2	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0014_P0024_P05CE_P05CF_HiEngSpdHiDsblEc

Description: Exhaust cam is disabled when engine speed exceeds this value

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000

Initial Supporting table - P0014_P0024_P05CE_P05CF_HiEngSpdLoEnblEc

Description: Exhaust cam is enabled when engine speed remains below this value

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoPresHiEnblEc

Description: Exhaust cam is enabled when oil pressure exceeds this value

Value Units: Engine Oil Pressure (kPa)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoPresLoDsblEc

Description: Exhaust cam is disabled when oil pressure falls below this value

Value Units: Engine Oil Pressure (kPa)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoRpmHiEnblEc

Description: Exhaust cam is enabled when engine speed exceeds this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	400	400	400	400	450	450	450	450	450	450	450	450	450	1,200	1,400	1,650	7,600

Initial Supporting table - P0014_P0024_P05CE_P05CF_LoRpmLoDsblEc

Description: Exhaust cam is disabled when engine speed is below this value.

Value Units: Engine Speed (rpm)
X Unit: Engine Oil Temp (degC)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300	300	300	300	350	350	350	350	350	350	350	350	350	1,100	1,300	1,550	7,500

Initial Supporting table - P0014_P05CE_StablePositionTimeEc1

Description: Minimum time for Exhaust Cam 1 phase position to be stable to enable performance diagnostic.

Value Units: Minimum time (sec)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
3,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
3,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Initial Supporting table - P00C4_P2261_KtBSTD_r_SurgeLim

Description: Turbo compressor recirculation valve diagnosis surge area limit.

Value Units: [ratio] CRV diagnosis surge area limit.
X Unit: [g/sec[] KnBSTD_dm_AirFlowBP - Air FLow

y/x	0.00	38.09	76.63	100.00	143.52	189.11
1	1.000	1.500	2.444	2.700	3.100	3.412

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

Description: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix - This table describes combinations of individual model failures that will set P0101, P0106, P010B, P0121, P0236 and P1101 on turbocharged applications.

Value Units: Boolean
X Unit: Unitless (See top line for heading information)
Y Units: Unitless

y/x	1	2	3	4	5	6	7	8	9
1	MAF Model	MAP1 Model	MAP2 Model	MAP3 Model	TIAP1 Model	TPS Model	TIAP Correlation	TIAP Correlation	DTC Set
2	Failed	Failed	Failed	Failed	Failed	Failed	Failed	Valid	
3	F	F	F	F	F	F	F	F	No DTC
4	F	F	F	F	F	F	F	T	No DTC
5	F	F	F	F	F	F	T	F	No DTC
6	F	F	F	F	F	F	T	T	No DTC
7	F	F	F	F	F	T	F	F	No DTC
8	F	F	F	F	F	T	F	T	No DTC
9	F	F	F	F	F	T	T	F	No DTC
10	F	F	F	F	F	T	T	T	No DTC
11	F	F	F	F	T	F	F	F	No DTC
12	F	F	F	F	T	F	F	T	No DTC
13	F	F	F	F	T	F	T	F	No DTC
14	F	F	F	F	T	F	T	T	No DTC
15	F	F	F	F	T	T	F	F	P1101
16	F	F	F	F	T	T	F	T	P0121
17	F	F	F	F	T	T	T	F	P1101
18	F	F	F	F	T	T	T	T	P0236
19	F	F	F	T	F	F	F	F	No DTC
20	F	F	F	T	F	F	F	T	P1101
21	F	F	F	T	F	F	T	F	P1101
22	F	F	F	T	F	F	T	T	P1101
23	F	F	F	T	F	T	F	F	P1101
24	F	F	F	T	F	T	F	T	P1101
25	F	F	F	T	F	T	T	F	P1101
26	F	F	F	T	F	T	T	T	P1101
27	F	F	F	T	T	F	F	F	P1101
28	F	F	F	T	T	F	F	T	P1101
29	F	F	F	T	T	F	T	F	P1101
30	F	F	F	T	T	F	T	T	P1101
31	F	F	F	T	T	T	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

32	F	F	F	T	T	T	F	T	P1101
33	F	F	F	T	T	T	T	F	P1101
34	F	F	F	T	T	T	T	T	P1101
35	F	F	T	F	F	F	F	F	No DTC
36	F	F	T	F	F	F	F	T	P1101
37	F	F	T	F	F	F	T	F	P1101
38	F	F	T	F	F	F	T	T	P1101
39	F	F	T	F	F	T	F	F	P1101
40	F	F	T	F	F	T	F	T	P1101
41	F	F	T	F	F	T	T	F	P1101
42	F	F	T	F	F	T	T	T	P1101
43	F	F	T	F	T	F	F	F	P1101
44	F	F	T	F	T	F	F	T	P1101
45	F	F	T	F	T	F	T	F	P1101
46	F	F	T	F	T	F	T	T	P1101
47	F	F	T	F	T	T	F	F	P1101
48	F	F	T	F	T	T	F	T	P1101
49	F	F	T	F	T	T	T	F	P1101
50	F	F	T	F	T	T	T	T	P1101
51	F	F	T	T	F	F	F	F	P1101
52	F	F	T	T	F	F	F	T	P1101
53	F	F	T	T	F	F	T	F	P1101
54	F	F	T	T	F	F	T	T	P1101
55	F	F	T	T	F	T	F	F	P1101
56	F	F	T	T	F	T	F	T	P1101
57	F	F	T	T	F	T	T	F	P1101
58	F	F	T	T	F	T	T	T	P1101
59	F	F	T	T	T	F	F	F	No DTC
60	F	F	T	T	T	F	F	T	No DTC
61	F	F	T	T	T	F	T	F	No DTC
62	F	F	T	T	T	F	T	T	No DTC
63	F	F	T	T	T	T	F	F	P1101
64	F	F	T	T	T	T	F	T	P1101
65	F	F	T	T	T	T	T	F	P1101
66	F	F	T	T	T	T	T	T	P1101
67	F	T	F	F	F	F	F	F	No DTC
68	F	T	F	F	F	F	F	T	P1101
69	F	T	F	F	F	F	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

70	F	T	F	F	F	F	T	T	P0236
71	F	T	F	F	F	T	F	F	P1101
72	F	T	F	F	F	T	F	T	P0121
73	F	T	F	F	F	T	T	F	P1101
74	F	T	F	F	F	T	T	T	P0236
75	F	T	F	F	T	F	F	F	P1101
76	F	T	F	F	T	F	F	T	P1101
77	F	T	F	F	T	F	T	F	P1101
78	F	T	F	F	T	F	T	T	P0236
79	F	T	F	F	T	T	F	F	P1101
80	F	T	F	F	T	T	F	T	P0121
81	F	T	F	F	T	T	T	F	P1101
82	F	T	F	F	T	T	T	T	P0236
83	F	T	F	T	F	F	F	F	P1101
84	F	T	F	T	F	F	F	T	P1101
85	F	T	F	T	F	F	T	F	P1101
86	F	T	F	T	F	F	T	T	P1101
87	F	T	F	T	F	T	F	F	P1101
88	F	T	F	T	F	T	F	T	P1101
89	F	T	F	T	F	T	T	F	P1101
90	F	T	F	T	F	T	T	T	P1101
91	F	T	F	T	T	F	F	F	P1101
92	F	T	F	T	T	F	F	T	P1101
93	F	T	F	T	T	F	T	F	P1101
94	F	T	F	T	T	F	T	T	P1101
95	F	T	F	T	T	T	F	F	P1101
96	F	T	F	T	T	T	F	T	P1101
97	F	T	F	T	T	T	T	F	P1101
98	F	T	F	T	T	T	T	T	P1101
99	F	T	T	F	F	F	F	F	P1101
100	F	T	T	F	F	F	F	T	P1101
101	F	T	T	F	F	F	T	F	P1101
102	F	T	T	F	F	F	T	T	P1101
103	F	T	T	F	F	T	F	F	P1101
104	F	T	T	F	F	T	F	T	P1101
105	F	T	T	F	F	T	T	F	P1101
106	F	T	T	F	F	T	T	T	P1101
107	F	T	T	F	T	F	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

108	F	T	T	F	T	F	F	T	P1101
109	F	T	T	F	T	F	T	F	P1101
110	F	T	T	F	T	F	T	T	P1101
111	F	T	T	F	T	T	F	F	P1101
112	F	T	T	F	T	T	F	T	P1101
113	F	T	T	F	T	T	T	F	P1101
114	F	T	T	F	T	T	T	T	P1101
115	F	T	T	T	F	F	F	F	P0106
116	F	T	T	T	F	F	F	T	P0106
117	F	T	T	T	F	F	T	F	P0106
118	F	T	T	T	F	F	T	T	P0106
119	F	T	T	T	F	T	F	F	P1101
120	F	T	T	T	F	T	F	T	P1101
121	F	T	T	T	F	T	T	F	P1101
122	F	T	T	T	F	T	T	T	P1101
123	F	T	T	T	T	F	F	F	P1101
124	F	T	T	T	T	F	F	T	P1101
125	F	T	T	T	T	F	T	F	P1101
126	F	T	T	T	T	F	T	T	P1101
127	F	T	T	T	T	T	F	F	P1101
128	F	T	T	T	T	T	F	T	P1101
129	F	T	T	T	T	T	T	F	P1101
130	F	T	T	T	T	T	T	T	P1101
131	T	F	F	F	F	F	F	F	No DTC
132	T	F	F	F	F	F	F	T	P1101
133	T	F	F	F	F	F	T	F	P1101
134	T	F	F	F	F	F	T	T	P0236
135	T	F	F	F	F	T	F	F	P1101
136	T	F	F	F	F	T	F	T	P0121
137	T	F	F	F	F	T	T	F	P1101
138	T	F	F	F	F	T	T	T	P0236
139	T	F	F	F	T	F	F	F	P1101
140	T	F	F	F	T	F	F	T	P1101
141	T	F	F	F	T	F	T	F	P1101
142	T	F	F	F	T	F	T	T	P0236
143	T	F	F	F	T	T	F	F	P1101
144	T	F	F	F	T	T	F	T	P0121
145	T	F	F	F	T	T	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

146	T	F	F	F	T	T	T	T	P0236
147	T	F	F	T	F	F	F	F	P1101
148	T	F	F	T	F	F	F	T	P1101
149	T	F	F	T	F	F	T	F	P1101
150	T	F	F	T	F	F	T	T	P1101
151	T	F	F	T	F	T	F	F	P1101
152	T	F	F	T	F	T	F	T	P1101
153	T	F	F	T	F	T	T	F	P1101
154	T	F	F	T	F	T	T	T	P1101
155	T	F	F	T	T	F	F	F	P1101
156	T	F	F	T	T	F	F	T	P1101
157	T	F	F	T	T	F	T	F	P1101
158	T	F	F	T	T	F	T	T	P1101
159	T	F	F	T	T	T	F	F	P1101
160	T	F	F	T	T	T	F	T	P1101
161	T	F	F	T	T	T	T	F	P1101
162	T	F	F	T	T	T	T	T	P1101
163	T	F	T	F	F	F	F	F	P1101
164	T	F	T	F	F	F	F	T	P1101
165	T	F	T	F	F	F	T	F	P1101
166	T	F	T	F	F	F	T	T	P1101
167	T	F	T	F	F	T	F	F	P1101
168	T	F	T	F	F	T	F	T	P1101
169	T	F	T	F	F	T	T	F	P1101
170	T	F	T	F	F	T	T	T	P1101
171	T	F	T	F	T	F	F	F	P1101
172	T	F	T	F	T	F	F	T	P1101
173	T	F	T	F	T	F	T	F	P1101
174	T	F	T	F	T	F	T	T	P1101
175	T	F	T	F	T	T	F	F	P1101
176	T	F	T	F	T	T	F	T	P1101
177	T	F	T	F	T	T	T	F	P1101
178	T	F	T	F	T	T	T	T	P1101
179	T	F	T	T	F	F	F	F	P1101
180	T	F	T	T	F	F	F	T	P1101
181	T	F	T	T	F	F	T	F	P1101
182	T	F	T	T	F	F	T	T	P1101
183	T	F	T	T	F	T	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

184	T	F	T	T	F	T	F	T	P1101
185	T	F	T	T	F	T	T	F	P1101
186	T	F	T	T	F	T	T	T	P1101
187	T	F	T	T	T	F	F	F	P0101 or P010B
188	T	F	T	T	T	F	F	T	P0101 or P010B
189	T	F	T	T	T	F	T	F	P0101 or P010B
190	T	F	T	T	T	F	T	T	P0101 or P010B
191	T	F	T	T	T	T	F	F	P1101
192	T	F	T	T	T	T	F	T	P1101
193	T	F	T	T	T	T	T	F	P1101
194	T	F	T	T	T	T	T	T	P1101
195	T	T	F	F	F	F	F	F	P1101
196	T	T	F	F	F	F	F	T	P1101
197	T	T	F	F	F	F	T	F	P1101
198	T	T	F	F	F	F	T	T	P0236
199	T	T	F	F	F	T	F	F	P1101
200	T	T	F	F	F	T	F	T	P0121
201	T	T	F	F	F	T	T	F	P1101
202	T	T	F	F	F	T	T	T	P0236
203	T	T	F	F	T	F	F	F	P1101
204	T	T	F	F	T	F	F	T	P1101
205	T	T	F	F	T	F	T	F	P1101
206	T	T	F	F	T	F	T	T	P0236
207	T	T	F	F	T	T	F	F	P1101
208	T	T	F	F	T	T	F	T	P0121
209	T	T	F	F	T	T	T	F	P1101
210	T	T	F	F	T	T	T	T	P0236
211	T	T	F	T	F	F	F	F	P1101
212	T	T	F	T	F	F	F	T	P1101
213	T	T	F	T	F	F	T	F	P1101
214	T	T	F	T	F	F	T	T	P1101
215	T	T	F	T	F	T	F	F	P1101
216	T	T	F	T	F	T	F	T	P1101
217	T	T	F	T	F	T	T	F	P1101
218	T	T	F	T	F	T	T	T	P1101
219	T	T	F	T	T	F	F	F	P1101
220	T	T	F	T	T	F	F	T	P1101
221	T	T	F	T	T	F	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

222	T	T	F	T	T	F	T	T	P1101
223	T	T	F	T	T	T	F	F	P1101
224	T	T	F	T	T	T	F	T	P1101
225	T	T	F	T	T	T	T	F	P1101
226	T	T	F	T	T	T	T	T	P1101
227	T	T	T	F	F	F	F	F	P1101
228	T	T	T	F	F	F	F	T	P1101
229	T	T	T	F	F	F	T	F	P1101
230	T	T	T	F	F	F	T	T	P1101
231	T	T	T	F	F	T	F	F	P1101
232	T	T	T	F	F	T	F	T	P1101
233	T	T	T	F	F	T	T	F	P1101
234	T	T	T	F	F	T	T	T	P1101
235	T	T	T	F	T	F	F	F	P1101
236	T	T	T	F	T	F	F	T	P1101
237	T	T	T	F	T	F	T	F	P1101
238	T	T	T	F	T	F	T	T	P1101
239	T	T	T	F	T	T	F	F	P1101
240	T	T	T	F	T	T	F	T	P1101
241	T	T	T	F	T	T	T	F	P1101
242	T	T	T	F	T	T	T	T	P1101
243	T	T	T	T	F	F	F	F	P1101
244	T	T	T	T	F	F	F	T	P1101
245	T	T	T	T	F	F	T	F	P1101
246	T	T	T	T	F	F	T	T	P1101
247	T	T	T	T	F	T	F	F	P1101
248	T	T	T	T	F	T	F	T	P1101
249	T	T	T	T	F	T	T	F	P1101
250	T	T	T	T	F	T	T	T	P1101
251	T	T	T	T	T	F	F	F	P1101
252	T	T	T	T	T	F	F	T	P1101
253	T	T	T	T	T	F	T	F	P1101
254	T	T	T	T	T	F	T	T	P1101
255	T	T	T	T	T	T	F	F	P1101
256	T	T	T	T	T	T	F	T	P1101
257	T	T	T	T	T	T	T	F	P1101
258	T	T	T	T	T	T	T	T	P1101

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.950	0.950	1.000	0.950	0.950	0.950	0.950	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP3 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	0.900	1.000	1.000	1.000	0.850	0.850	1.000	0.900	0.950	0.950	0.950	0.987

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 TPS Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P0236_P1101 TIAP Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	0.700	0.700	1.000	1.000	1.000	1.000	1.000	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.880	0.900

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Max Air Flow

Value Units: Engine Air Flow (Grams/Second)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	13.0	13.0	13.0	16.0	20.0	24.0	28.0	31.0	32.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Max MAP

Value Units: Manifold Pressure (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Offset

Value Units: Pressure Difference (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	0.0	1.5	3.5	6.0	9.0	12.0	16.0	20.0	25.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Min Air Flow

Value Units: Engine Air Flow (Grams/Second)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	17.0	47.0	85.0	124.0	162.0	184.0	206.0	206.0	206.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Min MAP

Value Units: Manifold Pressure (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	110.0	158.0	192.0	203.0	214.0	207.0	200.0	182.0	182.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Offset

Value Units: Pressure Difference (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Initial Supporting table - P0234_KtBSTD_p_CntrlDevNegLim

Description: Negative boost pressure control deviation fail limit.

Value Units: [kPa] Negative boost pressure deviation limit.
X Unit: [kPa] KnBSTD_p_CntrlDevDiagDsrdBP - Boost pressure
Y Units: [rpm] KnBSTD_n_CntrlDevDiagEngSpdBP - Engine speed

y/x	5.00	50.00	100.00	120.00	140.00	160.00	180.00	200.00	250.00	300.00
1,000	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00
1,500	-100.00	-80.00	-80.00	-80.00	-80.00	-80.00	-80.00	-80.00	-80.00	-80.00
2,000	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
2,500	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
3,000	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
3,500	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
4,000	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
4,500	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
5,000	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00
6,000	-100.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00	-30.00

Initial Supporting table - P0234_P0299_KtBSTD_p_CntrlDevAmbAirCorr

Description: Additative offset on boost pressure control deviation fail limit.

Value Units: [kPa] Control Deviation - Ambient correction.
X Unit: [kPa] KnBSTD_p_CntrlDevDiagAmbCorrBP - Ambient Air Pressure
Y Units: [rpm] KnBSTD_n_CntrlDevDiagAmbCorrBP - Engine Speed

y/x	60.00	70.00	80.00	90.00	100.00	110.00
1,500	130.00	130.00	130.00	130.00	130.00	130.00
2,500	125.00	120.00	90.00	55.00	0.00	0.00
3,000	115.00	105.00	75.00	35.00	0.00	0.00
4,000	65.00	60.00	50.00	25.00	0.00	0.00
5,000	30.00	25.00	20.00	10.00	0.00	0.00
6,000	0.00	0.00	0.00	0.00	0.00	0.00

Initial Supporting table - P0234_P0299_KtBSTD_t_CntrlDevEnblDelay

Description: Timer to stabilize enable conditions for over and underboost diagnosis.

Value Units: [sec] Pressure control deviation diagnosis enable delay.
X Unit: [rpm] KnBSTD_n_CntrlDevDiagEngSpdBP - Engine Speed

y/x	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	6,000
1	1.7500	1.5000	1.3750	1.1250	1.0000	0.8750	0.7500	0.6250	0.5000	0.5000

Initial Supporting table -P0299_KtBSTD_p_CntrlDevPosLim

Description: Positive boost pressure control deviation fail limit.

Value Units: [kPa] Positive boost pressure deviation limit.
X Unit: [kPa] KnBSTD_p_CntrlDevDiagDsrdBP - Boost pressure
Y Units: [rpm] KnBSTD_n_CntrlDevDiagEngSpdBP - Engine speed

y/x	5.00	50.00	100.00	120.00	140.00	160.00	180.00	200.00	250.00	300.00
1,000	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1,500	100.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	130.00
2,000	100.00	80.00	80.00	75.00	40.00	40.00	40.00	50.00	80.00	120.00
2,500	100.00	80.00	80.00	75.00	40.00	40.00	40.00	40.00	60.00	90.00
3,000	100.00	80.00	80.00	75.00	40.00	40.00	40.00	40.00	40.00	80.00
3,500	100.00	50.00	50.00	50.00	40.00	40.00	40.00	40.00	40.00	80.00
4,000	100.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	40.00	80.00
4,500	100.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	40.00	80.00
5,000	100.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	40.00	80.00
6,000	100.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	40.00	80.00

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on MAF Est

Value Units: Weight Factor (Unitless)
X Unit: Estimated Engine Air Flow (Grams/Second)

y/x	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	230	250
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - Closed Loop Enable Clarification - KaFCLP_U_SlphrIntglOfst_Thrsh

Description: Integral Offset voltage thresholds (bank and cell specific cals) used with KeFCLP_Pct_CatAccuSlphrPostDsbl to check for sulphur poisoning.

Value Units: millivolts
X Unit: Post Catalyst Number

y/x	CiOXYR_O2_PostCat1	CiOXYR_O2_PostCat2
CiFCLP_Decel	2,048	2,048
CiFCLP_Idle	2,048	2,048
CiFCLP_Cruise	2,048	2,048
CiFCLP_LightAccel	2,048	2,048
CiFCLP_HeavyAccel	2,048	2,048

Initial Supporting table - Closed Loop Enable Clarification - KcFCLP_Cnt_O2RdyCyclesThrsh

Description: Number of times a post oxygen sensor value must be in range before declaring it ready

Value Units: Time (events * 12.5 milliseconds)

y/x	1
1	80

Initial Supporting table - Closed Loop Enable Clarification - KcFULC_O2_SensorReadyEvents

Description: Number of times a pre oxygen sensor value must be in range before declaring it ready

Value Units: Time (events * 12.5 milliseconds)

y/x	1
1	2

Initial Supporting table - Closed Loop Enable Clarification - KeEOSD_U_RichThrsh

Description: The oxygen sensor voltage above which a sensor will be considered failing during a Rich Test.

Value Units: Volts

y/x	1
1	1,050

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_dm_IntegrationAirflowMax

Description: Maximum allowed estimated airflow for post O2 integral terms to be updated.

Value Units: Grams per Second

y/x	1
1	512

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_Pct_CatAccuSlphrPostDsbl

Description: Sulphur percent threshold above which post integral learning is disabled if the threshold criteria KaFCLP_U_SlphrIntglOfst_Thrsh is also met.

Value Units: Percent

y/x	1
1	255

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMax

Description: Maximum allowed estimated catalytic converter temperature for post O2 integral terms to be updated.

Value Units: Celcius

y/x	1
1	1,000

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMin

Description: Minimum allowed estimated catalytic converter temperature to begin using post O2 integration correction terms. Converter temperature must remain above this threshold to ramp-in the post O2 integration adjustments. Once the ramp-in has started, a converter temperature below this threshold will freeze the ramp-in multiplier. Post O2 integration will not be allowed below this converter temperature

Value Units: Celcius

y/x	1
1	425

Initial Supporting table - Closed Loop Enable Clarification - KeWRSC_T_HtrCntrlCL

Description: WRAF heater temperature enabling threshold for transition from Open Loop to Closed Loop

Value Units: Degrees Celcius

y/x	1
1	628

Initial Supporting table - Closed Loop Enable Clarification - KeWRSI_T_PumpCurrentEnable

Description: WRAF heater temperature threshold for enabling the sensor pump current

Value Units: Degrees Celcius

y/x	1
1	628

Initial Supporting table - Closed Loop Enable Clarification - KfFCLL_T_AdaptiveHiCoolant

Description: LTM learning is inhibited if the engine coolant temperature is above this calibration.

Value Units: Degrees Celcius

y/x	1
1	255

Initial Supporting table - Closed Loop Enable Clarification - KfFCLL_T_AdaptiveLoCoolant

Description: LTM learning is inhibited if the engine coolant temperature is below this calibration.

Value Units: Degrees Celcius

y/x	1
1	40

Initial Supporting table - Closed Loop Enable Clarification - KfFCLP_U_O2ReadyThrshLo

Description: Voltage limit checked against when determining if a post converter oxygen sensor is in range

Value Units: millivolts

y/x	1
1	1,100

Initial Supporting table - Closed Loop Enable Clarification - KfFULC_U_O2_SensorReadyThrshLo

Description: Voltage limit checked against when determining if a pre converter oxygen sensor is in range

Value Units: millivolts

y/x	1
1	1,250

Initial Supporting table - Closed Loop Enable Clarification - KtFCLL_p_AdaptiveLowMAP_Limit

Description: Long term fuel learning is disabled below this MAP limit as a function of barometric pressure.

Value Units: KPa
X Unit: KPa

y/x	65	70	75	80	85	90	95	100	105
1	16.0	16.0	16.0	16.0	16.0	17.0	18.0	18.0	18.0

Initial Supporting table - Closed Loop Enable Clarification - KtFCLP_t_PostIntglDisableTime

Description: Disable integral offset after engine start for this amount of time as a function of start up coolant temperature.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-29	-18	-6	5	16	28	39	50	61	73	84	95	106	118	129	140
1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.0	60.0	50.0	50.0	50.0	50.0	50.0	50.0

Initial Supporting table - Closed Loop Enable Clarification - KtFCLP_t_PostIntglRampInTime

Description: Time required to ramp integral offset to desired value as a function of start up coolant temperature.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-29	-18	-6	5	16	28	39	50	61	73	84	95	106	118	129	140
1	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	40.0	30.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0

Initial Supporting table - Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopAutostart

Description: Engine run time following an autostart, as a function of begin run coolant, which must be exceeded to enable CLOSED LOOP.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300.0	300.0	230.0	90.0	80.0	32.0	32.0	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Initial Supporting table - Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopTime

Description: Engine run time, as a function of startup coolant temperature, which must be exceeded to enable CLOSED LOOP.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300.0	300.0	230.0	90.0	80.0	32.0	32.0	32.0	32.0	32.0	0.0	0.0	0.0	30.0	45.0	45.0	45.0

Initial Supporting table - P0234_KtBSTD_p_CntrlDevBasLim

Description: Overboost under basic pressure (open loop pressure control) diagnose failure limit.

Value Units: [kPa] Overboost under basic pressure fail limit.
X Unit: [kPa] KnBSTD_p_CntrlDevDiagAmbCorrBP - Ambient Air Pressure
Y Units: [rpm] KnBSTD_n_CntrlDevDiagAmbCorrBP - Engine Speed

y/x	60.00	70.00	80.00	90.00	100.00	110.00
1,500.00	90.000	90.000	80.000	70.000	60.000	60.000
2,500.00	62.000	52.000	32.000	30.000	30.000	30.000
3,000.00	42.000	25.000	10.000	10.000	10.000	10.000
4,000.00	30.000	10.000	10.000	10.000	10.000	10.000
5,000.00	30.000	10.000	10.000	10.000	10.000	10.000
6,000.00	30.000	10.000	10.000	10.000	10.000	10.000

Initial Supporting table - P0299_KtBSTD_p_CntrlDevDsrdRtHi

Description: Allowed positive rate limit on desired boost pressure. In allowed kPa per 100 ms.

Value Units: [kPa] Allowed positive rate limit
X Unit: [rpm] KnBSTD_n_CntrlDevDiagEngSpdBP - Engine Speed

y/x	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	6,000
1	2.000	2.500	2.700	2.900	3.000	3.000	3.100	3.200	3.500	4.000

Initial Supporting table - P0299_KtBSTD_p_CntrlDevDsrdRtLo

Description: Allowed negative rate limit on desired boost pressure. In allowed kPa per 100 ms.

Value Units: [kPa] Allowed negative rate limit.
X Unit: [rpm] KnBSTD_n_CntrlDevDiagEngSpdBP - Engine Speed

y/x	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	6,000
1	-200.00	-200.00	-200.00	-200.00	-200.00	-200.00	-200.00	-200.00	-200.00	-200.00

Initial Supporting table - P0521_P06DD_P06DE_OP_HiStatePressure

Description: Two Stage Oil Pump Oil Pressure in High State

Value Units: Nominal high state oil pressure (kPa)
X Unit: Engine oil temperature (deg C)

y/x	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0
1,000.0	492.1	459.1	428.6	390.5	350.4	302.9	252.1	215.1	168.9
1,500.0	534.7	510.1	488.6	463.3	435.8	402.9	367.0	332.6	270.4
2,000.0	556.8	538.8	521.3	499.9	477.1	450.9	416.0	387.1	347.6
2,500.0	570.0	554.6	540.3	523.1	500.6	476.6	444.9	414.8	374.9
3,000.0	570.5	557.6	543.2	528.2	509.5	487.6	452.2	422.8	388.7
3,500.0	562.8	552.0	537.9	522.3	508.8	490.6	461.4	435.9	404.2
4,000.0	549.8	535.8	526.1	517.8	510.4	497.2	470.1	442.3	407.7
4,500.0	547.8	535.4	526.4	517.9	510.3	498.4	475.6	449.1	417.2
5,000.0	542.5	532.5	526.1	523.0	510.9	500.4	472.6	454.7	420.0

Initial Supporting table - P06DD_P06DE_MaxEnableTorque_OP

Description: Two Stage Oil Pump Rationality Test Torque Max Enable Threshold

Value Units: Maximum engine torque (Nm)
X Unit: Engine speed (RPM)

y/x	1,000.0	1,250.0	1,500.0	1,750.0	2,000.0	2,250.0	2,500.0	2,750.0	3,000.0
1.0	0.0	0.0	140.0	140.0	140.0	140.0	140.0	0.0	0.0

Initial Supporting table - P06DD_P06DE_MinEnableTorque_OP

Description: Two Stage Oil Pump Rationality Test Torque Min Enable Threshold

Value Units: Min engine torque (Nm)
X Unit: Engine speed (RPM)

y/x	1,000.0	1,250.0	1,500.0	1,750.0	2,000.0	2,250.0	2,500.0	2,750.0	3,000.0
1.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0

Initial Supporting table - P06DD_P06DE_MinOilPressThresh

Description: Intrusive diagnostic minimum pressure limit that is a function of Engine Speed and Oil Temperature

Value Units: Minimum engine oil pressure threshold (kPa)
X Unit: Engine oil temperature (deg C)

y/x	40	50	60	70	80	90	100	110	120
1,000	160	160	160	160	160	160	160	160	160
1,500	160	160	160	160	160	160	160	160	160
2,000	187	187	187	187	187	187	187	187	187
2,500	200	200	200	200	200	200	200	200	200
3,000	200	200	200	200	200	200	200	200	200
3,500	200	200	200	200	200	200	200	200	200
4,000	200	200	200	200	200	200	200	200	200
4,500	200	200	200	200	200	200	200	200	200
5,000	1,133	1,133	1,133	1,133	1,133	1,133	1,133	1,133	1,133

Initial Supporting table - P06DD_P06DE_OP_LoStatePressure

Description: Two Stage Oil Pump Oil Pressure in Low State

Value Units: Nominal low state oil pressure (kPa)
X Unit: Engine oil temperature (deg C)

y/x	40	50	60	70	80	90	100	110	120
1,000	325	309	295	280	265	250	228	207	169
1,500	347	336	326	314	300	284	266	253	232
2,000	359	350	341	330	318	307	290	276	256
2,500	363	353	345	339	329	319	304	290	269
3,000	363	356	349	341	333	323	309	295	280
3,500	361	355	348	339	331	323	312	301	287
4,000	357	347	339	335	325	325	314	303	282
4,500	351	344	338	333	326	324	315	305	295
5,000	347	340	334	329	325	321	312	303	294

Initial Supporting table - P06DD_P06DE_OP_StateChangeMin

Description: Minimum allowed pressure change on a Two Stage Oil Pump state change

Value Units: Min pressure change (kPa)
X Unit: Engine oil temperature (deg C)

y/x	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0
1,000.0	66.7	60.1	53.4	40.9	0.0	0.0	0.0	0.0	0.0
1,500.0	75.1	69.8	65.3	59.9	54.3	47.6	40.6	31.8	15.4
2,000.0	79.1	75.4	72.1	68.1	63.6	57.8	50.3	44.5	36.8
2,500.0	83.0	80.5	77.9	73.9	68.8	63.3	56.4	50.0	42.5
3,000.0	83.0	80.4	77.7	74.8	70.5	65.6	57.3	51.1	43.6
3,500.0	80.9	78.9	76.1	73.3	71.1	66.9	59.8	54.1	46.7
4,000.0	77.3	75.4	74.7	73.0	74.0	68.8	62.6	55.7	33.5
4,500.0	78.7	76.7	75.1	74.0	73.6	69.9	64.4	57.8	49.1
5,000.0	78.3	77.0	76.8	77.8	74.4	71.7	64.3	60.6	50.4

Initial Supporting table - P171D hydraulic pressure delay

Description: Time to delay the initial x of y counter due to hydraulic transients. Thresholds are a function of transmission fluid temperature. Horizontal axis is transmission fluid temperature (DegC) and table output is delay time (seconds).

Value Units: delay time seconds
X Unit: transmission fluid temperature DegC

y/x	-40	0	20	30	40	50	60
1	0.090	0.090	0.080	0.075	0.075	0.075	0.075

Initial Supporting table - P171D predicted turbine speed error

Description: Predicted turbine speed vs actual turbine speed error. Thresholds are a function of engine speed and transmission fliud temperature. Diagnostic is considered failing above these values. Table vertical axis is engine speed (RPM), horizontal axis is transmission fluid temperature (DegC) and table output is predicted turbine speed error (RPM).

Value Units: turbine speed RPM error
X Unit: transmission fluid temperature DegC
Y Units: engine speed RPM

y/x	-40	0	10	20	40
0	350	350	350	350	350
500	350	350	350	350	350
1,100	350	350	350	350	350
1,500	350	350	350	350	350
2,500	350	350	350	350	350

Initial Supporting table - P1065_UCAP_Arm_Autostart_Thresh_Derating_Zero

Description: This is the minimum Cap voltage to arm an AutoStop-Start. When the charging diagnostic is enabled, and the Cap voltage is less than the table value a failure counter is incrementated.

Value Units: Volts
X Unit: The axis of this table is ESC capacitor state of health level (0 to 100%)

y/x	0	13	25	38	50	63	75	88	100
1	3.90	3.80	3.80	3.70	3.70	3.70	3.70	3.70	3.70

Initial Supporting table - P0411 Phase 1 Amb Temp Test Weight Factor

Description: SAI Flow (Phase 1) Test ambient temperature weight factor.

y/x	-30	-20	-10	0	10	20	30	40	50
1	0.0	0.0	0.0	0.5	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P0411 Phase 1 Baro Test Weight Factor

Description: SAI Flow (Phase 1) Test baro weight factor.

y/x	40	50	60	70	80	90	100	110	120
1	0.0	0.0	0.5	1.0	1.0	1.0	1.0	1.0	0.0

Initial Supporting table - P0411 Phase 1 MAF Test Weight Factor

Description: KtAIRD_K_SAI_TstMAF_Dsbld: SAI Flow (Phase 1) Test MAF weight factor.

y/x	0.0	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	33.0	36.0	39.0	42.0	45.0	48.0
1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0

Initial Supporting table - P0411 Phase 1 System Volt Test Weight Factor

Description: SAI Flow (Phase 1) Test system voltage weight factor.

y/x	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.8	1.0	1.0	1.0	1.0	1.0	0.8	0.5	0.5	0.5	0.5

Initial Supporting table - P0411 SL Threshold Bank 1 Table

Description: Bank 1 SAI Flow (Phase 1) Test Average String Length failure threshold versus MAF (g/sec).

y/x	0.0	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	33.0	36.0	39.0	42.0	45.0	48.0
1.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0

Initial Supporting table - P2431_P2436 Baro Skewed Sensor Weight Factor

Description: The AIR Pressure Sensor Test quality factor based on the distance traveled since the last unthrottled ambient pressure update.

y/x	0.0	2.0	4.0	6.0	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
1.0	1.0	0.8	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Initial Supporting table - P2440 Bank 1 Valve Pressure Error

Description: Sensor 1 minimum average pressure error (kPa) threshold for the valve-shut (Phase 2) test .

y/x	0	1	2	3	4	5	6	7	8
1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0

Initial Supporting table - P2440 Phase 2 Amb Temp Test Weight Factor

Description: Ambient Temperature component of the conditional test weight for the valve-shut (Phase 2) test.

y/x	-30	-20	-10	0	10	20	30	40	50
1	0.0	0.0	0.0	0.5	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P2440 Phase 2 Baro Test Weight Factor

Description: Ambient pressure component of the conditional test weight for the valve-shut (Phase 2) test .

y/x	40	50	60	70	80	90	100	110	120
1	0.0	0.0	0.5	1.0	1.0	1.0	1.0	1.0	0.0

Initial Supporting table - P2440 Phase 2 MAF Test Weight Factor

Description: Mass Airflow (MAF) component of the conditional test weight for the valve-shut (Phase 2) test.

y/x	0.0	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	33.0	36.0	39.0	42.0	45.0	48.0
1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.0	0.0	0.0	0.0	0.0

Initial Supporting table - P2440 Phase 2 System Volt Test Weight Factor

Description: System Voltage component of the conditional test weight for the valve-shut (Phase 2) test.

y/x	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.8	1.0	1.0	1.0	1.0	1.0	0.8	0.5	0.5	0.5	0.5

Initial Supporting table - P2444 Bank 1 Pump Pressure Error

Description: Sensor 1 maximum average pressure error threshold for the pump-off (Phase 3) test.

y/x	0	1	2	3	4	5	6	7	8
1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Initial Supporting table - Multiple DTC Use_Green Sensor Delay Criteria - Limit

Description: This Calibration is the acculmulated airflow limit above which the Green condition is expired
Used for: P0133, P013A, P013B, P013C, P013D, P013E, P013F, P014A, P014B, P0153, P015A, P015B, P015C, P015D, P1133, P1153, P2270, P2271, P2272 and P2273.
Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.

Value Units: Grams
X Unit: Acculmulated Engine Airflow

y/x	CiOXYR_O2_Bank1_Sensor1	CiOXYR_O2_Bank1_Sensor2	CiOXYR_O2_Bank2_Sensor1	CiOXYR_O2_Bank2_Sensor2
1	120,000	120,000	120,000	120,000

Initial Supporting table - P00C4_P2261_KtBSTD_r_SurgeLim

Description: Turbo compressor recirculation valve diagnosis surge area limit.

Value Units: [ratio] CRV diagnosis surge area limit.
X Unit: [g/sec[] KnBSTD_dm_AirFlowBP - Air FLow

y/x	7.40	18.60	47.37	71.53	97.92	129.60
1	1.250	1.650	2.148	2.754	3.072	3.432

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

Description: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix - This table describes combinations of individual model failures that will set P0101, P0106, P010B, P0121, P0236 and P1101 on turbocharged applications.

Value Units: Boolean
X Unit: Unitless (See top line for heading information)
Y Units: Unitless

y/x	1	2	3	4	5	6	7	8	9
1	MAF Model	MAP1 Model	MAP2 Model	MAP3 Model	TIAP1 Model	TPS Model	TIAP Correlation	TIAP Correlation	DTC Set
2	Failed	Failed	Failed	Failed	Failed	Failed	Failed	Valid	
3	F	F	F	F	F	F	F	F	No DTC
4	F	F	F	F	F	F	F	T	No DTC
5	F	F	F	F	F	F	T	F	No DTC
6	F	F	F	F	F	F	T	T	No DTC
7	F	F	F	F	F	T	F	F	No DTC
8	F	F	F	F	F	T	F	T	No DTC
9	F	F	F	F	F	T	T	F	No DTC
10	F	F	F	F	F	T	T	T	No DTC
11	F	F	F	F	T	F	F	F	No DTC
12	F	F	F	F	T	F	F	T	No DTC
13	F	F	F	F	T	F	T	F	No DTC
14	F	F	F	F	T	F	T	T	No DTC
15	F	F	F	F	T	T	F	F	P1101
16	F	F	F	F	T	T	F	T	P0121
17	F	F	F	F	T	T	T	F	P1101
18	F	F	F	F	T	T	T	T	P0236
19	F	F	F	T	F	F	F	F	No DTC
20	F	F	F	T	F	F	F	T	P1101
21	F	F	F	T	F	F	T	F	P1101
22	F	F	F	T	F	F	T	T	P1101
23	F	F	F	T	F	T	F	F	P1101
24	F	F	F	T	F	T	F	T	P1101
25	F	F	F	T	F	T	T	F	P1101
26	F	F	F	T	F	T	T	T	P1101
27	F	F	F	T	T	F	F	F	P1101
28	F	F	F	T	T	F	F	T	P1101
29	F	F	F	T	T	F	T	F	P1101
30	F	F	F	T	T	F	T	T	P1101
31	F	F	F	T	T	T	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

32	F	F	F	T	T	T	F	T	P1101
33	F	F	F	T	T	T	T	F	P1101
34	F	F	F	T	T	T	T	T	P1101
35	F	F	T	F	F	F	F	F	No DTC
36	F	F	T	F	F	F	F	T	P1101
37	F	F	T	F	F	F	T	F	P1101
38	F	F	T	F	F	F	T	T	P1101
39	F	F	T	F	F	T	F	F	P1101
40	F	F	T	F	F	T	F	T	P1101
41	F	F	T	F	F	T	T	F	P1101
42	F	F	T	F	F	T	T	T	P1101
43	F	F	T	F	T	F	F	F	P1101
44	F	F	T	F	T	F	F	T	P1101
45	F	F	T	F	T	F	T	F	P1101
46	F	F	T	F	T	F	T	T	P1101
47	F	F	T	F	T	T	F	F	P1101
48	F	F	T	F	T	T	F	T	P1101
49	F	F	T	F	T	T	T	F	P1101
50	F	F	T	F	T	T	T	T	P1101
51	F	F	T	T	F	F	F	F	P1101
52	F	F	T	T	F	F	F	T	P1101
53	F	F	T	T	F	F	T	F	P1101
54	F	F	T	T	F	F	T	T	P1101
55	F	F	T	T	F	T	F	F	P1101
56	F	F	T	T	F	T	F	T	P1101
57	F	F	T	T	F	T	T	F	P1101
58	F	F	T	T	F	T	T	T	P1101
59	F	F	T	T	T	F	F	F	No DTC
60	F	F	T	T	T	F	F	T	No DTC
61	F	F	T	T	T	F	T	F	No DTC
62	F	F	T	T	T	F	T	T	No DTC
63	F	F	T	T	T	T	F	F	P1101
64	F	F	T	T	T	T	F	T	P1101
65	F	F	T	T	T	T	T	F	P1101
66	F	F	T	T	T	T	T	T	P1101
67	F	T	F	F	F	F	F	F	No DTC
68	F	T	F	F	F	F	F	T	P1101
69	F	T	F	F	F	F	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

70	F	T	F	F	F	F	T	T	P0236
71	F	T	F	F	F	T	F	F	P1101
72	F	T	F	F	F	T	F	T	P0121
73	F	T	F	F	F	T	T	F	P1101
74	F	T	F	F	F	T	T	T	P0236
75	F	T	F	F	T	F	F	F	P1101
76	F	T	F	F	T	F	F	T	P1101
77	F	T	F	F	T	F	T	F	P1101
78	F	T	F	F	T	F	T	T	P0236
79	F	T	F	F	T	T	F	F	P1101
80	F	T	F	F	T	T	F	T	P0121
81	F	T	F	F	T	T	T	F	P1101
82	F	T	F	F	T	T	T	T	P0236
83	F	T	F	T	F	F	F	F	P1101
84	F	T	F	T	F	F	F	T	P1101
85	F	T	F	T	F	F	T	F	P1101
86	F	T	F	T	F	F	T	T	P1101
87	F	T	F	T	F	T	F	F	P1101
88	F	T	F	T	F	T	F	T	P1101
89	F	T	F	T	F	T	T	F	P1101
90	F	T	F	T	F	T	T	T	P1101
91	F	T	F	T	T	F	F	F	P1101
92	F	T	F	T	T	F	F	T	P1101
93	F	T	F	T	T	F	T	F	P1101
94	F	T	F	T	T	F	T	T	P1101
95	F	T	F	T	T	T	F	F	P1101
96	F	T	F	T	T	T	F	T	P1101
97	F	T	F	T	T	T	T	F	P1101
98	F	T	F	T	T	T	T	T	P1101
99	F	T	T	F	F	F	F	F	P1101
100	F	T	T	F	F	F	F	T	P1101
101	F	T	T	F	F	F	T	F	P1101
102	F	T	T	F	F	F	T	T	P1101
103	F	T	T	F	F	T	F	F	P1101
104	F	T	T	F	F	T	F	T	P1101
105	F	T	T	F	F	T	T	F	P1101
106	F	T	T	F	F	T	T	T	P1101
107	F	T	T	F	T	F	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

108	F	T	T	F	T	F	F	T	P1101
109	F	T	T	F	T	F	T	F	P1101
110	F	T	T	F	T	F	T	T	P1101
111	F	T	T	F	T	T	F	F	P1101
112	F	T	T	F	T	T	F	T	P1101
113	F	T	T	F	T	T	T	F	P1101
114	F	T	T	F	T	T	T	T	P1101
115	F	T	T	T	F	F	F	F	P0106
116	F	T	T	T	F	F	F	T	P0106
117	F	T	T	T	F	F	T	F	P0106
118	F	T	T	T	F	F	T	T	P0106
119	F	T	T	T	F	T	F	F	P1101
120	F	T	T	T	F	T	F	T	P1101
121	F	T	T	T	F	T	T	F	P1101
122	F	T	T	T	F	T	T	T	P1101
123	F	T	T	T	T	F	F	F	P1101
124	F	T	T	T	T	F	F	T	P1101
125	F	T	T	T	T	F	T	F	P1101
126	F	T	T	T	T	F	T	T	P1101
127	F	T	T	T	T	T	F	F	P1101
128	F	T	T	T	T	T	F	T	P1101
129	F	T	T	T	T	T	T	F	P1101
130	F	T	T	T	T	T	T	T	P1101
131	T	F	F	F	F	F	F	F	No DTC
132	T	F	F	F	F	F	F	T	P1101
133	T	F	F	F	F	F	T	F	P1101
134	T	F	F	F	F	F	T	T	P0236
135	T	F	F	F	F	T	F	F	P1101
136	T	F	F	F	F	T	F	T	P0121
137	T	F	F	F	F	T	T	F	P1101
138	T	F	F	F	F	T	T	T	P0236
139	T	F	F	F	T	F	F	F	P1101
140	T	F	F	F	T	F	F	T	P1101
141	T	F	F	F	T	F	T	F	P1101
142	T	F	F	F	T	F	T	T	P0236
143	T	F	F	F	T	T	F	F	P1101
144	T	F	F	F	T	T	F	T	P0121
145	T	F	F	F	T	T	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

146	T	F	F	F	T	T	T	T	P0236
147	T	F	F	T	F	F	F	F	P1101
148	T	F	F	T	F	F	F	T	P1101
149	T	F	F	T	F	F	T	F	P1101
150	T	F	F	T	F	F	T	T	P1101
151	T	F	F	T	F	T	F	F	P1101
152	T	F	F	T	F	T	F	T	P1101
153	T	F	F	T	F	T	T	F	P1101
154	T	F	F	T	F	T	T	T	P1101
155	T	F	F	T	T	F	F	F	P1101
156	T	F	F	T	T	F	F	T	P1101
157	T	F	F	T	T	F	T	F	P1101
158	T	F	F	T	T	F	T	T	P1101
159	T	F	F	T	T	T	F	F	P1101
160	T	F	F	T	T	T	F	T	P1101
161	T	F	F	T	T	T	T	F	P1101
162	T	F	F	T	T	T	T	T	P1101
163	T	F	T	F	F	F	F	F	P1101
164	T	F	T	F	F	F	F	T	P1101
165	T	F	T	F	F	F	T	F	P1101
166	T	F	T	F	F	F	T	T	P1101
167	T	F	T	F	F	T	F	F	P1101
168	T	F	T	F	F	T	F	T	P1101
169	T	F	T	F	F	T	T	F	P1101
170	T	F	T	F	F	T	T	T	P1101
171	T	F	T	F	T	F	F	F	P1101
172	T	F	T	F	T	F	F	T	P1101
173	T	F	T	F	T	F	T	F	P1101
174	T	F	T	F	T	F	T	T	P1101
175	T	F	T	F	T	T	F	F	P1101
176	T	F	T	F	T	T	F	T	P1101
177	T	F	T	F	T	T	T	F	P1101
178	T	F	T	F	T	T	T	T	P1101
179	T	F	T	T	F	F	F	F	P1101
180	T	F	T	T	F	F	F	T	P1101
181	T	F	T	T	F	F	T	F	P1101
182	T	F	T	T	F	F	T	T	P1101
183	T	F	T	T	F	T	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

184	T	F	T	T	F	T	F	T	P1101
185	T	F	T	T	F	T	T	F	P1101
186	T	F	T	T	F	T	T	T	P1101
187	T	F	T	T	T	F	F	F	P0101 or P010B
188	T	F	T	T	T	F	F	T	P0101 or P010B
189	T	F	T	T	T	F	T	F	P0101 or P010B
190	T	F	T	T	T	F	T	T	P0101 or P010B
191	T	F	T	T	T	T	F	F	P1101
192	T	F	T	T	T	T	F	T	P1101
193	T	F	T	T	T	T	T	F	P1101
194	T	F	T	T	T	T	T	T	P1101
195	T	T	F	F	F	F	F	F	P1101
196	T	T	F	F	F	F	F	T	P1101
197	T	T	F	F	F	F	T	F	P1101
198	T	T	F	F	F	F	T	T	P0236
199	T	T	F	F	F	T	F	F	P1101
200	T	T	F	F	F	T	F	T	P0121
201	T	T	F	F	F	T	T	F	P1101
202	T	T	F	F	F	T	T	T	P0236
203	T	T	F	F	T	F	F	F	P1101
204	T	T	F	F	T	F	F	T	P1101
205	T	T	F	F	T	F	T	F	P1101
206	T	T	F	F	T	F	T	T	P0236
207	T	T	F	F	T	T	F	F	P1101
208	T	T	F	F	T	T	F	T	P0121
209	T	T	F	F	T	T	T	F	P1101
210	T	T	F	F	T	T	T	T	P0236
211	T	T	F	T	F	F	F	F	P1101
212	T	T	F	T	F	F	F	T	P1101
213	T	T	F	T	F	F	T	F	P1101
214	T	T	F	T	F	F	T	T	P1101
215	T	T	F	T	F	T	F	F	P1101
216	T	T	F	T	F	T	F	T	P1101
217	T	T	F	T	F	T	T	F	P1101
218	T	T	F	T	F	T	T	T	P1101
219	T	T	F	T	T	F	F	F	P1101
220	T	T	F	T	T	F	F	T	P1101
221	T	T	F	T	T	F	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

222	T	T	F	T	T	F	T	T	P1101
223	T	T	F	T	T	T	F	F	P1101
224	T	T	F	T	T	T	F	T	P1101
225	T	T	F	T	T	T	T	F	P1101
226	T	T	F	T	T	T	T	T	P1101
227	T	T	T	F	F	F	F	F	P1101
228	T	T	T	F	F	F	F	T	P1101
229	T	T	T	F	F	F	T	F	P1101
230	T	T	T	F	F	F	T	T	P1101
231	T	T	T	F	F	T	F	F	P1101
232	T	T	T	F	F	T	F	T	P1101
233	T	T	T	F	F	T	T	F	P1101
234	T	T	T	F	F	T	T	T	P1101
235	T	T	T	F	T	F	F	F	P1101
236	T	T	T	F	T	F	F	T	P1101
237	T	T	T	F	T	F	T	F	P1101
238	T	T	T	F	T	F	T	T	P1101
239	T	T	T	F	T	T	F	F	P1101
240	T	T	T	F	T	T	F	T	P1101
241	T	T	T	F	T	T	T	F	P1101
242	T	T	T	F	T	T	T	T	P1101
243	T	T	T	T	F	F	F	F	P1101
244	T	T	T	T	F	F	F	T	P1101
245	T	T	T	T	F	F	T	F	P1101
246	T	T	T	T	F	F	T	T	P1101
247	T	T	T	T	F	T	F	F	P1101
248	T	T	T	T	F	T	F	T	P1101
249	T	T	T	T	F	T	T	F	P1101
250	T	T	T	T	F	T	T	T	P1101
251	T	T	T	T	T	F	F	F	P1101
252	T	T	T	T	T	F	F	T	P1101
253	T	T	T	T	T	F	T	F	P1101
254	T	T	T	T	T	F	T	T	P1101
255	T	T	T	T	T	T	F	F	P1101
256	T	T	T	T	T	T	F	T	P1101
257	T	T	T	T	T	T	T	F	P1101
258	T	T	T	T	T	T	T	T	P1101

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	0.900	0.935	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.949	1.000	1.000	1.000	0.992	0.973	0.950	0.950

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP3 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 TPS Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P0236_P1101 TIAP Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	1.000	1.000	1.000	1.000	0.614	0.612	0.645	0.702	0.878	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Max Air Flow

Value Units: Engine Air Flow (Grams/Second)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	6.5	8.5	10.0	15.0	18.0	22.0	12.0	13.0	13.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Max MAP

Value Units: Manifold Pressure (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	40.0	37.0	33.0	31.0	28.0	28.0	30.0	30.0	30.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Offset

Value Units: Pressure Difference (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	0.7	0.5	0.5	0.7	1.0	1.5	2.0	2.5	3.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Min Air Flow

Value Units: Engine Air Flow (Grams/Second)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	24.0	36.0	55.0	85.0	100.0	140.0	150.0	150.0	150.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Min MAP

Value Units: Manifold Pressure (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	105.0	108.0	115.0	130.0	140.0	150.0	150.0	150.0	150.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Offset

Value Units: Pressure Difference (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	1.5	1.0	1.0	1.3	2.5	3.0	3.3	4.0	5.0

Initial Supporting table - P00C7: Twin Turbo Failure Matrix

Description: Intake Air Pressure System Performance Failure Matrix for Twin Turbo Applications. This table describes the combination of intake system pressure sensor difference combinations that will set P00C7 on twin turbocharged applications

Value Units: Yes or No
X Unit: Unitless (See top line for heading information)
Y Units: Unitless

y/x	1	2	3	4	5	6	7
1	DTC	MAP & TCBP Diff	MAP & Baro Diff	MAP & Baro B Diff	TCBP & Baro Diff	TCBP & Baro B Diff	Baro & Baro B Diff
2	No DTC	N	N	N	N	N	N
3	P00C7	Y	N	N	N	N	N
4	P00C7	N	Y	N	N	N	N
5	P00C7	Y	Y	N	N	N	N
6	P00C7	N	N	Y	N	N	N
7	P00C7	Y	N	Y	N	N	N
8	P00C7	N	Y	Y	N	N	N
9	P0106	Y	Y	Y	N	N	N
10	P00C7	N	N	N	Y	N	N
11	P00C7	Y	N	N	Y	N	N
12	P00C7	N	Y	N	Y	N	N
13	P00C7	Y	Y	N	Y	N	N
14	P00C7	N	N	Y	Y	N	N
15	P00C7	Y	N	Y	Y	N	N
16	P00C7	N	Y	Y	Y	N	N
17	P00C7	Y	Y	Y	Y	N	N
18	P00C7	N	N	N	N	Y	N
19	P00C7	Y	N	N	N	Y	N
20	P00C7	N	Y	N	N	Y	N
21	P00C7	Y	Y	N	N	Y	N
22	P00C7	N	N	Y	N	Y	N
23	P00C7	Y	N	Y	N	Y	N
24	P00C7	N	Y	Y	N	Y	N
25	P00C7	Y	Y	Y	N	Y	N
26	P00C7	N	N	N	Y	Y	N
27	P0236	Y	N	N	Y	Y	N
28	P00C7	N	Y	N	Y	Y	N
29	P00C7	Y	Y	N	Y	Y	N
30	P00C7	N	N	Y	Y	Y	N
31	P00C7	Y	N	Y	Y	Y	N

Initial Supporting table - P00C7: Twin Turbo Failure Matrix

32	P00C7	N	Y	Y	Y	Y	N
33	P00C7	Y	Y	Y	Y	Y	N
34	P00C7	N	N	N	N	N	Y
35	P00C7	Y	N	N	N	N	Y
36	P00C7	N	Y	N	N	N	Y
37	P00C7	Y	Y	N	N	N	Y
38	P00C7	N	N	Y	N	N	Y
39	P00C7	Y	N	Y	N	N	Y
40	P00C7	N	Y	Y	N	N	Y
41	P00C7	Y	Y	Y	N	N	Y
42	P00C7	N	N	N	Y	N	Y
43	P00C7	Y	N	N	Y	N	Y
44	P2227	N	Y	N	Y	N	Y
45	P00C7	Y	Y	N	Y	N	Y
46	P00C7	N	N	Y	Y	N	Y
47	P00C7	Y	N	Y	Y	N	Y
48	P00C7	N	Y	Y	Y	N	Y
49	P00C7	Y	Y	Y	Y	N	Y
50	P00C7	N	N	N	N	Y	Y
51	P00C7	Y	N	N	N	Y	Y
52	P00C7	N	Y	N	N	Y	Y
53	P00C7	Y	Y	N	N	Y	Y
54	P222B	N	N	Y	N	Y	Y
55	P00C7	Y	N	Y	N	Y	Y
56	P00C7	N	Y	Y	N	Y	Y
57	P00C7	Y	Y	Y	N	Y	Y
58	P00C7	N	N	N	Y	Y	Y
59	P00C7	Y	N	N	Y	Y	Y
60	P00C7	N	Y	N	Y	Y	Y
61	P00C7	Y	Y	N	Y	Y	Y
62	P00C7	N	N	Y	Y	Y	Y
63	P00C7	Y	N	Y	Y	Y	Y
64	P00C7	N	Y	Y	Y	Y	Y
65	P00C7	Y	Y	Y	Y	Y	Y

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on MAF Est

Value Units: Weight Factor (Unitless)
X Unit: Estimated Engine Air Flow (Grams/Second)

y/x	0	50	70	73	76	79	82	85	89	95	100	110	120	150	200	280	350
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on MAF Est

Description: P0101_P0106_P010B_P0121_P0236_P1101 MAF2 Residual Weight Factor based on MAF Est

Value Units: Weight Factor (Unitless)
X Unit: Estimated Engine Air Flow (Grams/Second)

y/x	0	50	70	73	76	79	82	85	89	95	100	110	120	150	200	280	350
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: MAF2 Residual Weight Factor based on RPM

Description: P0101_P0106_P010B_P0121_P0236_P1101 MAF2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Air Flow (Grams/Second)

y/x	600	950	1,300	1,650	2,000	2,350	2,700	3,050	3,400	3,750	4,100	4,450	4,800	5,150	5,500	6,000	6,500
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Initial Supporting table - C12B1_KtBMCR_K_DeltaPrsScoreWeight

Description:

y/x	0.000	250.000	400.000	500.000	800.000	1,100.000	2,200.000	2,400.000	2,600.000	2,800.000	3,000.000
1.000	0.000	0.000	0.600	0.800	0.900	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P057B KtBRKI_K_CmpltTestPointWeight

Description:

y/x	0.00	0.04	0.08	0.25	0.35	0.45	0.55	0.75	1.00
1.00	0.00	0.50	0.80	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - P057B KtBRKI_K_FastTestPointWeight

Description:

y/x	0.00	0.05	0.08	0.25	0.35	0.45	0.55	0.75	1.00
1.00	0.20	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - Pump Feedback Fault High Threshold

Description: Pump Feedback Fault High Threshold

y/x	10	10	30	40	50	60	70	80	90	100
1	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870

Initial Supporting table - Pump Feedback Fault Low Threshold

Description: Pump Feedback Fault Low Threshold

y/x	10	10	30	40	50	60	70	80	90	100
1	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870

Initial Supporting table - Pump Feedback Repass High Threshold

Description: Pump Feedback Repass High Threshold

y/x	10	10	30	40	50	60	70	80	90	100
1	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496

Initial Supporting table - Pump Feedback Repass Low Threshold

Description: Pump Feedback Repass Low Threshold

y/x	10	10	30	40	50	60	70	80	90	100
1	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496

Initial Supporting table - P171D hydraulic pressure delay

Description: Time to delay the initial x of y counter due to hydraulic transients. Thresholds are a function of transmission fluid temperature. Horizontal axis is transmission fluid temperature (DegC) and table output is delay time (seconds).

y/x	-40	0	20	30	40	50	60
1	0.100	0.100	0.100	0.100	0.100	0.100	0.100

Initial Supporting table - P171D predicted turbine speed error

Description: Predicted turbine speed vs actual turbine speed error. Thresholds are a function of engine speed and transmission fliud temperature. Diagnostic is considered failing above these values. Table vertical axis is engine speed (RPM), horizontal axis is transmission fluid temperature (DegC) and table output is predicted turbine speed error (RPM).

y/x	-40	0	10	20	40
0	350	350	350	350	350
500	350	350	350	350	350
1,100	350	350	350	350	350
1,500	350	350	350	350	350
2,500	350	350	350	350	350

Initial Supporting table - Fan Feedback Fault high Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	90
1	431	431	758	1,039	1,321	1,607	2,032	2,415	2,807	2,918

Initial Supporting table - Fan Feedback Fault low Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	90
1	-1,039	-1,039	-985	-841	-639	-600	-600	-600	-600	-600

Initial Supporting table - Fan Feedback Repass High Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	90
1	345	345	606	831	1,057	1,286	1,626	1,932	2,246	2,334

Initial Supporting table - Fan Feedback Repass Low Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	90
1	-831	-831	-788	-672	-511	-480	-480	-480	-480	-480

Initial Supporting table - KtBSED_P_BPD_C_EndOfLifePwrThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	0.87	1.81	3.84	6.86	11.00	11.00	11.00
20	0.67	1.42	3.03	5.41	11.00	11.00	11.00
30	0.61	1.29	2.82	5.10	11.00	11.00	11.00
50	0.50	1.09	2.41	4.34	9.49	11.00	11.00
70	0.34	0.76	1.69	3.04	6.63	9.65	10.50
80	0.25	0.55	1.22	2.21	4.83	6.93	7.47
90	0.14	0.31	0.68	1.24	2.74	3.91	4.22

Initial Supporting table - KtBSED_P_BPD_C_MinPassPowerThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	0.87	1.81	3.84	6.86	11.00	11.00	11.00
20	0.67	1.42	3.03	5.41	11.00	11.00	11.00
30	0.61	1.29	2.82	5.10	11.00	11.00	11.00
50	0.50	1.09	2.41	4.34	9.49	11.00	11.00
70	0.34	0.76	1.69	3.04	6.63	9.65	10.50
80	0.25	0.55	1.22	2.21	4.83	6.93	7.47
90	0.14	0.31	0.68	1.24	2.74	3.91	4.22

Initial Supporting table - KtBSED_P_BPD_D_EndOfLifePwrThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	-0.75	-1.26	-2.28	-3.74	-6.18	-10.42	-10.50
20	-0.90	-1.59	-2.97	-5.05	-9.09	-10.50	-10.50
30	-0.97	-1.76	-3.35	-5.73	-10.50	-10.50	-10.50
50	-1.08	-2.04	-3.92	-6.66	-10.50	-10.50	-10.50
70	-1.20	-2.30	-4.44	-7.53	-10.50	-10.50	-10.50
80	-1.27	-2.43	-4.70	-7.99	-10.50	-10.50	-10.50
90	-1.32	-2.54	-4.92	-8.40	-10.50	-10.50	-10.50

Initial Supporting table - KtBSED_P_BPD_D_MinPassPowerThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	-0.75	-1.26	-2.28	-3.74	-6.18	-10.42	-10.50
20	-0.90	-1.59	-2.97	-5.05	-9.09	-10.50	-10.50
30	-0.97	-1.76	-3.35	-5.73	-10.50	-10.50	-10.50
50	-1.08	-2.04	-3.92	-6.66	-10.50	-10.50	-10.50
70	-1.20	-2.30	-4.44	-7.53	-10.50	-10.50	-10.50
80	-1.27	-2.43	-4.70	-7.99	-10.50	-10.50	-10.50
90	-1.32	-2.54	-4.92	-8.40	-10.50	-10.50	-10.50

Initial Supporting table - KtBSED_U_BOV_CellVoltThresh

Description:

y/x	-30	-20	-10	0	10	20	30	40	50
1	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50

Initial Supporting table - KtBSED_U_BOV_PackVoltThresh

Description:

y/x	-30	-20	-10	0	10	20	30	40	50
1	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00

Initial Supporting table -KtBSED_U_BUV_CellVoltThresh

Description:

y/x	-30	-20	-10	0	10	20	30	40	50
1	1.64	1.64	1.64	1.64	1.64	1.80	1.80	1.80	1.80

Initial Supporting table - KtBSED_U_BUV_PackVoltThresh

Description:

y/x	-30	-20	-10	0	10	20	30	40	50
1	39.46	39.46	39.46	39.46	39.46	43.15	43.15	43.15	43.15

Bundle Name: 5VoltReferenceB_FA
P0651
Bundle Name: 5VoltReferenceMAP_OOR_Flt
P0697
Bundle Name: A/F Imbalance Bank1
P219A
Bundle Name: A/F Imbalance Bank2
P219B
Bundle Name: AAP_SnsrCktFA
Naturally aspirated: P2228, P2229. Turbocharged: P0237, P0238
Bundle Name: AAP_SnsrCktFP
Naturally aspirated: P2228, P2229. Turbocharged: P0237, P0238
Bundle Name: AAP_SnsrFA
Naturally Aspirated: P2227, P2228, P2229, P2230. Turbocharged: P0237, P0238.
Bundle Name: AccCktLo_FA
P2537
Bundle Name: AcceleratorPedalFailure
P2122, P2123, P2127, P2128, P2138, P0697, P06A3
Bundle Name: AfterThrottlePressureFA
Naturally Aspirated or Turbocharged: P0106, P0107, P0108. Supercharged: P012B, P012C, P012D.
Bundle Name: AIR System FA
P0411, P2440, P2444
Bundle Name: AmbientAirDefault
Baro Sensor Present: P2227, P2228, P2229, P2230. No Baro Sensor Present: P0101, P0102, P0103, P0106, P0107, P0108, P0111, P0112, P0113, P0114, P0121, P0122, P0123, P012B, P012C, P012D, P0222, P0223, P1221
Bundle Name: AmbPresDfltdStatus
Baro Sensor Present: P2227, P2228, P2229, P2230. No Baro Sensor Present: P0101, P0102, P0103, P0106, P0107, P0108, P0111, P0112, P0113, P0114, P0121, P0122, P0123, P012B, P012C, P012D, P0222, P0223, P1221
Bundle Name: AmbPresSnsrCktFA
P2228, P2229
Bundle Name: AnyCamPhaser_FA
P0010, P0011, P0013, P0014, P0020, P0021, P0023, P0024, P2088, P2089, P2090, P2091, P2092, P2093, P2094, P2095, P05CC, P05CD, P05CE, P05CF,
Bundle Name: AnyCamPhaser_TFTKO
P0010, P0011, P0013, P0014, P0020, P0021, P0023, P0024, P2088, P2089, P2090, P2091, P2092, P2093, P2094, P2095, P05CC, P05CD, P05CE, P05CF,
Bundle Name: BrakeBoosterSensorCktFA

P0557, P0558
Bundle Name: CamLctnExhFA
P0017, P0019, P0365, P0366, P0390, P0391
Bundle Name: CamLctnIntFA
P0016, P0018, P0340, P0341, P0345, P0346
Bundle Name: CamSensorAnyLctnTFTKO
P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391
Bundle Name: CamSensorAnyLocationFA
P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391
Bundle Name: CamSnsrExhTFTKO
P0017, P0019, P0365, P0366, P0390, P0391
Bundle Name: CamSnsrIntTFTKO
P0016, P0018, P0340, P0341, P0345, P0346
Bundle Name: Catalyst Warmup Enabled
N/A

Catalyst Warmup Enabled - Other Definitions:
To enable the Cold Start Emission Reduction Strategy:

Catalyst Temperature < 350.00 degC
AND
Engine Coolant > -10.00 degC
AND
Engine Coolant <= 56.00 degC
AND
Barometric Pressure>= 74.00 KPa
AND

DTC's Not Set:

ECT_Sensor_FA
MAP_SensorFA

The Cold Start Emission Reduction Strategy will remain active until:

Engine Run Time > **P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit** This Extended Engine run time exit is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details.

OR

Catalyst Temperature >= 900.00 degC
AND
Engine Run Time >= 19.00 seconds

OR

Barometric Pressure < 74.00 KPa
Bundle Name: ClutchPstnSnsr FA
P0806, P0807, P0808
Bundle Name: CrankSensor_FA
P0335, P0336
Bundle Name: CrankSensor_TFTKO
P0335, P0336
Bundle Name: ECT_Sensor_Ckt_FA
P0117, P0118
Bundle Name: ECT_Sensor_Ckt_FP
P0117, P0118
Bundle Name: ECT_Sensor_Ckt_TFTKO
P0117, P0118
Bundle Name: ECT_Sensor_DefaultDetected
P0116, P0117, P0118, P0119, P111E
Bundle Name: ECT_Sensor_FA
P0116, P0117, P0118, P0119, P0128, P111E
Bundle Name: ECT_Sensor_Perf_FA
P0116, P111E
Bundle Name: EGRValve_FP
P0405, P0406, P042E
Bundle Name: EGRValveCircuit_FA
P0403, P0404, P0405, P0406, P0489, P0490, P042E, P1426, P1437
Bundle Name: EGRValvePerformance_FA
P0404, P042E, P0401
Bundle Name: EngineMisfireDetected_FA
P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308
Bundle Name: EngineModeNotRunTimer_FA
P2610
Bundle Name: EngineModeNotRunTimerError
P2610
Bundle Name: EnginePowerLimited
P0068, P00C8, P00C9, P00CA, P0090, P0091, P0092, P0122, P0123, P0191, P0192, P0193, P0222, P0223, P0601, P0604, P0606, P0697, P06A3, P06DB, P06D2, P06DE, P0A1D, P1104, P127A, P127C, P127D, P15F2, P160D, P160E, P1682, P16A0, P16A1, P16A2, P16A7, P16F3, P2100, P2101, P2102, P2103, P2122, P2123, P2127, P2128, P2135, P2138, P215B, P2176, P228C, P228D, U0073, U0074, U0293, U1817
Bundle Name: EngineTorqueEstInaccurate
EngineMisfireDetected_FA, FuelInjedtorCircuit_FA, FuelInjedtorCircuit_TFTKO, FuelTrimSystemB1_FA, FuelTrimSystemB2_FA, MAF_SensorTFTKO, MAP_SensorTFTKO, EGRValvePerformance_FA, P16F3

EngineTorqueEstInaccurate - Other Definitions: P16F3 with GetXOYR_b_SecurityFlt (CeXOYR_e_MAPR_AfterThrotPresFlt, CeXOYR_e_MAPR_EngineVacuumFlt, CeXOYR_e_MAPR_IntkMnfdPresFlt, CeXOYR_e_MAFR_Ahead1vs2FinalFlt)
Bundle Name: EngOilPressureSensorCktFA
P0522, P0523
Bundle Name: EngOilPressureSensorFA
P0521, P0522, P0523
Bundle Name: EngOilTempFA
EngOilTempSensorCircuitFA, EngOilModeledTempValid, P16F3
EngOilTempFA - Other Definitions: P16F3 with GetXOYR_b_SecurityFlt(CeXOYR_e_EOTR_SecurityFlt)
Bundle Name: Ethanol Composition Sensor FA
P0178, P0179, P2269
Bundle Name: EvapEmissionSystem_FA
P0455, P0446
Bundle Name: EvapExcessPurgePsbl_FA
ELCP sealed/vented fuel system, P0442, P0455, P0458 OR Conventional fuel system, P0442, P0455, P0458, P0496
Bundle Name: EvapFlowDuringNonPurge_FA
P0496
Bundle Name: EvapPurgeSolenoidCircuit_FA
P0443, P0458, P0459
Bundle Name: EvapSmallLeak_FA
P0442
Bundle Name: EvapVentSolenoidCircuit_FA
P0449, P0498, P0499
Bundle Name: FHPR_b_FRP_SnsrCkt_FA
P0192, P0193, P127C, P127D, P16E4, P16E5, P128A, P128B, 128F
Bundle Name: FHPR_b_FRP_SnsrCkt_TFTKO
P0192, P0193, , P127C, P127D, P16E4, P16E5, P128A, P128B, 128F
Bundle Name: FHPR_b_PumpCkt_FA
P0090, P0091, P0092, P00C8, P00C9, P00CA
Bundle Name: FHPR_b_PumpCkt_TFTKO
P0090, P0091, P0092, P00C8, P00C9, P00CA
Bundle Name: FuelInjectorCircuit_FA
PFI: P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P0262, P0265, P0268, P0271, P0274, P0277, P0280, P0283 SIDI: P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P0262, P0265, P0268, P0271, P0274, P0277, P0280, P0283, P2147, P2150, P2153, P2156, P216B, P216E, P217B, P217E, P2148, P2151, P2154, P2157, P216C, P216F, P217C, P217F, P1248, P1249, P124A, P124B, P124C, P124D, P124E, P124F
Bundle Name: FuelInjectorCircuit_TFTKO

PFI: P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P0262, P0265, P0268, P0271, P0274, P0277, P0280, P0283 SIDI: P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P0262, P0265, P0268, P0271, P0274, P0277, P0280, P0283, P2147, P2150, P2153, P2156, P216B, P216E, P217B, P217E, P2148, P2151, P2154, P2157, P216C, P216F, P217C, P217F, P1248, P1249, P124A, P124B, P124C, P124D, P124E, P124F
Bundle Name: FuelLevelDataFault
P0461, P0462, P0463, P2066, P2067, P2068
FuelLevelDataFault - Other Definitions: AccCktLo_FA
Bundle Name: FuelPumpRlyCktFA
P0627, P0628, P0629
Bundle Name: FuelTankPressureSnsrCkt_FA
P0452, P0453
Bundle Name: FuelTrimSystemB1_FA
P0171, P0172, P11E9, P11EA, P2178
Bundle Name: FuelTrimSystemB2_FA
P0174, P0175, P11EB, P11EC, P2179
Bundle Name: HumTempSnsrCktFA
P0097, P0098
Bundle Name: IAC_SystemRPM_FA
P0506, P0507
Bundle Name: IAT_SensorCircuitFA
P0112, P0113
Bundle Name: IAT_SensorCircuitFP
P0112, P0113
Bundle Name: IAT_SensorFA
P0111, P0112, P0113, P0114
Bundle Name: IAT_SensorTFTKO
P0111, P0112, P0113, P0114
Bundle Name: IgnitionOffTimeValid
P2610
Bundle Name: IgnitionOutputDriver_FA
P0351, P0352, P0353, P0354, P0355, P0356, P0357, P0358, P2300, P2301, P2303, P2304, P2306, P2307, P2309, P2310, P2312, P2313, P2315, P2316, P2318, P2319, P2321, P2322
Bundle Name: MAF_SensorCircuitFA
P0102, P0103, P010C, P010D
Bundle Name: MAF_SensorFA
P0101, P0102, P0103, P010B, P010C, P010D
Bundle Name: MAF_SensorTFTKO
P0101, P0102, P0103, P010B, P010C, P010D

Bundle Name: MAP_EngineVacuumStatus
P0106, P0107, P0108 Fault Active OR P0107, P0108 Fault Pending
Bundle Name: MAP_SensorCircuitFA
P0107, P0108
Bundle Name: MAP_SensorCircuitFP
P0107, P0108
Bundle Name: MAP_SensorFA
P0106, P0107, P0108
Bundle Name: MAP_SensorTFTKO
P0106, P0107, P0108
Bundle Name: MnfdTempSensorCktFA
Turbocharged or Supercharged, with Humidity sensor: P00EA, P00EB. Turbocharged or Supercharged, without Humidity sensor: P0097, P0098. Naturally Aspirated: P0112, P0113.
Bundle Name: MnfdTempSensorCktFP
Turbocharged or Supercharged, with Humidity sensor: P00EA, P00EB. Turbocharged or Supercharged, without Humidity sensor: P0097, P0098. Naturally Aspirated: P0112, P0113.
Bundle Name: O2S_Bank_ 1_TFTKO
P0131, P0132, P0134, P2A00
Bundle Name: O2S_Bank_ 2_TFTKO
P0151, P0152, P0154, P2A03
Bundle Name: O2S_Bank_1_Sensor_1_FA
P2A00, P0131, P0132, P0133, P0134, P0135, P0053, P1133, P015A, P015B, P0030
Bundle Name: O2S_Bank_1_Sensor_2_FA
P013A, P013B, P013E, P013F, P2270, P2271, P0137, P0138, P0140, P0141, P0054, P0036
Bundle Name: O2S_Bank_2_Sensor_1_FA
P2A03, P0151, P0152, P0153, P0154, P0155, P0059, P1153, P015C, P015D, P0050
Bundle Name: O2S_Bank_2_Sensor_2_FA
P013C, P013D, P014A, P014B, P2272, P2273, P0157, P0158, P0160, P0161, P0060, P0056
Bundle Name: OAT_PtEstFiltFA
ECM OAT: P0071, P0072, P0073, P0074, EngModeNotRunTmErr, VehicleSpeedSensor_FA, IAT_SensorFA, ECT_Sensor_DefaultDetected, MAF_SensorFA. VIMC OAT: P0072, P0073, EngModeNotRunTmErr, VehicleSpeedSensor_FA, ECT_Sensor_DefaultDetected. IAT-Based OAT: VehicleSpeedSensor_FA, IAT_SensorFA, MAF_SensorFA. All other cases: EngModeNotRunTmErr, VehicleSpeedSensor_FA, IAT_SensorFA, ECT_Sensor_DefaultDetected.
Bundle Name: OAT_PtEstRawFA
ECM OAT: P0071, P0072, P0073, P0074. VIMC OAT: P0071, P0072, P0073, EngModeNotRunTmErr, VehicleSpeedSensor_FA, ECT_Sensor_DefaultDetected. IAT-Based OAT: IAT_SensorFA. All other cases: IAT_SensorFA, ECT_Sensor_DefaultDetected.
Bundle Name: OilPmpTFTKO
P06DA, P06DB, P06DC, P06DD, P06DE
OilPmpTFTKO - Other Definitions: TFTKO only for Output Driver and rationality
Bundle Name: PO2S_Bank_1_Snsr_2_FA
P0137, P0138, P0140, P0036, P0054, P0141, P2270, P2271

Bundle Name: PO2S_Bank_2_Snsr_2_FA
P0157, P0158, P0160, P0056, P0060, P0161, P2272, P2273
Bundle Name: PowertrainRelayFault
P1682, P16A7, P16BC
Bundle Name: PowertrainRelayStateOn_FA
P0685, P0686, P0687
Bundle Name: TC_BoostPresSnsrFA
P0236, P0237, P0238
Bundle Name: THMR_AHV_FA
P2681, P26A3, P26A6, P26A7, P26A9
THMR_AHV_FA - Other Definitions:
Bundle Name: THMR_AWP_AuxPumpFA
B269A, B269C, B269D
Bundle Name: THMR_RCT_Sensor_Ckt_FA
P00B3, P00B4
Bundle Name: THMR_SWP_Control_FA
P261A, P261D, P261C
Bundle Name: THMR_SWP_FlowStuckOn_FA
P261A, P261D, P261E
Bundle Name: THMR_SWP_NoFlow_FA
P261B, P261C
Bundle Name: TPS_FA
P0122, P0123, P0222, P0223, P16A0, P16A1, P16A2, P2135
Bundle Name: TPS_Performance_FA
P0068, P0121, P1104, P2100, P2101, P2102, P2103
Bundle Name: TPS_ThrottleAuthorityDefaulted
P0068, P0122, P0123, P0222, P0223, P16F3, P16A0, P16A1, P16A2, P1104, P2100, P2101, P2102, P2103, P2135
Bundle Name: Transmission Output Shaft Angular Velocity Validity
P0722, P0723, P077C, P077D
Bundle Name: TransmissionEngagedState_FA
P1824, P182A, P182B, P182C, P182D, P182E, P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915
Bundle Name: VehicleSpeedSensor_FA
P0502, P0503, P0722, P0723
Bundle Name: WRAF_Bank_1_FA
P0131, P0132, P064D, P223C, P223E
Bundle Name: WRAF_Bank_2_FA

P0151, P0152, P064E, P223D, P223F

Bundle Name: AAP2_SnsrCktFA
P2228, P2229
Bundle Name: AAP2_SnsrCktFP
P2228, P2229
Bundle Name: AAP2_SnsrFA
P2227, P2228, P2229, P2230
Bundle Name: AAP3_SnsrCktFA
P222C, P222D
Bundle Name: AAP3_SnsrCktFP
P222C, P222D
Bundle Name: AIRPumpControlCircuit FA
P0418, P2257, P2258
Bundle Name: AIRSystemPressureSensor FA
P2430, P2431, P2432, P2433, P2435, P2436, P2437, P2438
Bundle Name: AIRValveControlCircuit FA
P0412, P041F, P044F
Bundle Name: BSTR_b_BoostSnsrFA
P0106, P0107, P0108, P0236, P2228, P2229
BSTR_b_BoostSnsrFA - Other Definitions:
Turbo Charger: P0236, P2228, P2229 Super Charger: P0106, P0107, P0108
Bundle Name: BSTR_b_PCA_CktFA
P0033, P0034, P0035, P0045, P0047, P0048, P0243, P0245, P0246, P0247, P0249, P0250
Bundle Name: BSTR_b_PCA_TFTKO
P0033, P0034, P0035, P0045, P0047, P0048, P0234, P0243, P0245, P0246, P0247, P0249, P0250, P0299, P2261
Bundle Name: BSTR_b_TurboBypassCktFA
P0033, P0034, P0035, P00C0, P00C1, P00C2
Bundle Name: CatalystSysEfficiencyLoB1_FA
P0420
Bundle Name: CatalystSysEfficiencyLoB2_FA
P0430
Bundle Name: ClutchPstnSnsrCktHi FA
P0808
Bundle Name: ClutchPstnSnsrCktLo FA
P0807
Bundle Name: ClutchPstnSnsrNotLearned
P080A

Bundle Name: FuelTrimSystemB1_TFTKO
P0171, P0172
Bundle Name: FuelTrimSystemB2_TFTKO
P0174, P0175
Bundle Name: IAT_SensorCircuitTFTKO
P0112, P0113
Bundle Name: MAF_Snsr1_FA
P0101, P0102, P0103
Bundle Name: MnfdTempSensorFA
Turbocharged or Supercharged, with humididty sensor: P00E9, P00EA, P00EB, P00EC. Turbocharged or Supercharged, without humididty sensor: P0096, P0097, P0098, P0099. Naturally Aspirated: P0111, P0112, P0113, P0114.
Bundle Name: SCIAP_SensorCircuitFA
P012C, P012D
Bundle Name: SCIAP_SensorCircuitFP
P012C, P012D
Bundle Name: SCIAP_SensorFA
P012B, P012C, P012D
Bundle Name: TC_BoostPresSnsrCktFA
P0237, P0238
Bundle Name: THMR_ECT_Sensor_Ckt_FA
P0116, P0117, P0118, P0119, P111E
Bundle Name: Transmission Oil Temperature Validity
P0667, P0668, P0669, P0711, P0712, P0713
Bundle Name: TransmissionOutputRotationalStatusValidity
P0722, P0723, P077C, P077D
Bundle Name: Transmission Output Shaft Angular Velocity Validity
P0722, P0723, P077C, P077D
Bundle Name: Transmission Turbine Angular Velocity Validity
P0716, P0717, P07BF, P07CO
Bundle Name: UCAP_RmdlActFltFA
P01067, P1068, P1069, P106A, P106B, P106C, P106E, P106F, P1070, P1071, P1072, P1073, P1074, P1075, P1076, P1077, P1078, P1079, P107A, P107B, P107C, P107E, P107F, P1080, P1081, P108A, P108B, P108C, P108D, P108E, P108F, P1090, P1091
Bundle Name: UCAP_TempOOR_FA
P105B, P0105C, P005E, P105F, P1061, P1062
Bundle Name: UCAP_TempRatFA
P105D, P1060, P1063

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor 1 Circuit Low	C053E	This diagnostic monitors the Brake Pressure Sensor 1 for a voltage low condition. It compares the sensed sensor voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Brake Pressure Sensor 1 Voltage	<= 0.20 V	No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor 1 Circuit High	C053F	This diagnostic monitors the Brake Pressure Sensor 1 for a voltage high condition. It compares the sensed sensor voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Brake Pressure Sensor 1 Voltage	>= 4.80 V	No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor 2 Circuit Low	C0542	This diagnostic monitors the Brake Pressure Sensor 2 for a voltage low condition. It compares the sensed sensor voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Brake Pressure Sensor 2 Voltage	<= 0.20 V	No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor 2 Circuit High	C0543	This diagnostic monitors the Brake Pressure Sensor 2 for a voltage high condition. It compares the sensed sensor voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Brake Pressure Sensor 2 Voltage	>= 4.80 V	No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor Supply Circuit Voltage Low	C1219	This diagnostic monitors the Brake Pressure Sensor Supply Circuit for a voltage low condition. It compares the sensed supply voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Brake Pressure Sensor Supply Voltage	<= 4.50 V	No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor Supply Circuit Voltage High	C1220	This diagnostic monitors the Brake Pressure Sensor Supply Circuit for a voltage high condition. It compares the sensed supply voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Brake Pressure Sensor Supply Voltage	>= 5.50 V	No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Pressure Sensor 1/2 Correlation	C1239	This diagnostic checks for correlation between brake pressure sensor 1 and brake pressure sensor 2. It compares the absolute difference between sensor 1 and sensor 2 against a threshold. If the difference is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Absolute difference between brake pressure sensor 1 and brake pressure sensor 2	> 972.50 kPa	No Active DTCs No Active DTCs Run/Crank Voltage	EBCM Communication C1283, U0073, U0129 Brake Pressure Sensor Circuit Failures: C053E, C053F, C0542, C0543, C1219, C1220 >= 9.50 V	200.00 failures out of 250.00 samples 12.5 ms /sample 3.125 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pressure Sensor Signal Circuit	C1283	This diagnostic monitors the signal containing brake pressure data, sent from the electronic brake control module (EBCM) to the hybrid control module. Potential failures include the EBCM transceiver, the transmission line, the hybrid control module transceiver and the processing in both microprocessors. If the EBCM fails to increment an Alive Rolling Count (ARC) with each message or fails to calculate the checksum correctly, a fault is set in the hybrid control module.	Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0-3) ≠ Protection (Checksum) Value	Diagnostic System Code Clear Requested Diagnostic System Reset Complete Ignition Power Mode Run/Crank Voltage Above conditions met	FALSE TRUE = RUN >= 11.00 V > 0.50 s	10.00 failures out of a 12.00 sample moving window Executes every time GMLAN msg $1FE is received (50ms) 0.60 s	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Master Cylinder Pressure Sensor Offset Out of Range	C128B	This diagnostic monitors the calculated brake pressure when the actual brake pressure is expected to be zero. If the absolute measured pressure is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation. The X/Y counter will retain the most recent values between enable conditions.	Absolute filtered average of brake pressure sensor 1 and brake pressure sensor 2 Filter Constant 0.40	> 1,500.00 kPa	No Active DTCs No Active DTCs No Active DTCs Run/Crank Voltage Scaled Brake Pedal Position	EBCM Communication C1283, U0073, U0129 Brake Pressure Sensor Circuit Failures: C053E, C053F, C0542, C0543, C1219, C1220 Brake Pedal Position Sensor: P057B, P057C, P057D, P057E >= 9.50 V < 2.00 % for > 1.00 s	640.00 failures out of 800.00 samples 12.5 ms /sample 10.00 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Master Cylinder Pressure Sensor to Brake Pedal Position Sensor Correlation Error	C12B1	This diagnostic monitors the Brake Pressure Sensor for a stuck in range failure. The maximum brake pressure sensor value change is observed over a time period when the brake pressure is expected to change (when a moderate to significant change in brake pedal position is observed). If the change in brake pressure is below a threshold for a certain number of tests, the diagnostic will fail. This diagnostic uses EWMA for fault maturation.	Brake pressure difference is calculated, and a score is calculated from supporting table **C12B1_KtBMCR_K_DeltaPrsScoreWeight** This score is then applied to a total (EWMA) score, but is only allowed to affect the total score by a factor of 0.30 Total score	<= 0.40 (Fail) >= 0.80 (Pass)	No Active DTCs No Active DTCs No Active DTCs Run/Crank Voltage Engine State Brake Pedal Position Percent Wheel Slip	EBCM Communication C1283, U0073, U0129 Brake Pressure Sensor Circuit Failures: C053E, C053F, C0542, C0543, C1219, C1220 Brake Pedal Position Sensor: P057B, P057C, P057D, P057E >= 9.50 V Running < 2.00 % for 0.50 s THEN > 38.00 % for 0.50 s < 20.00 % for 2.00 s after upper brake pedal position (> 38.00 % for 0.50 s) is met.	Each calculated difference test will take at least 3.00 seconds (0.50 seconds minimum pedal stability + 0.50 seconds maximum pedal stability + 2.00 seconds wheel slip stability) 3.00 full tests must be completed before a FAIL can be reported 5.00 full tests must be completed before a PASS can be reported	Type A, 1 Trips

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 Low	P0506	This diagnostic monitors engine idle speed when the hybrid system is controlling idle through the motor/ generator. The difference between the target engine speed and actual engine speed is compared against an upper threshold. If the speed difference is above the upper failure threshold (the idle speed is lower than the targeted idle speed) for sufficient time, the diagnostic will fail.	Filtered Input Speed Error (Desired Idle Speed - Actual Idle Speed) (Filter coefficient for speed error = 0.003)	> 91 rpm (Fail) < 51 rpm (Pass)	No Active DTCs:	Motor speed faults: P0A3F, P1B03, P0A40, P16EB, P1E0A	Fail Condition: 1 loop execution at 100 ms rate	Type B, 2 Trips
					No Active DTCs:	Vehicle Speed/TOS sensor faults: P0722, P0723, P077B, P077D, U0101, U0073	100 ms	
					No Active DTCs:	Fuel Level Faults: P0128, P0461, P0462, P0463, P2066, P2067, P2068	Pass condition: 10.00 seconds	
					No Active DTCs:	Engine Coolant Temperature Faults: P0116, P0117, P0118, P0119, P111E		
					No Active DTCs	ECM CAN Communication: U0100		
					Low Fuel Condition	FALSE		
					Accelerator pedal position	<= 1.00 %		
					Engine State	Running (not starting or stopping states)		
					Vehicle Speed	<= 2 kph		
					Engine Coolant	>= 60.00 Deg C		
					Commanded RPM Delta	< 25.00 RPM		
					Hybrid Speed Control Active	>= 3.00 seconds		
					Idle Conditons Present (all conditions listed above are true)	>= 5.00 seconds		

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 diagnostic monitors engine idle speed when the hybrid system is controlling idle through the motor/ generator. The difference between the target engine speed and actual engine speed is compared against a lower threshold. If the speed difference is below the lower failure threshold (the idle speed is higher than the targeted idle speed) for sufficient time, the diagnostic will fail.	Filtered Input Speed Error (Desired Idle Speed - Actual Idle Speed) (Filter coefficient for speed error = 0.003)	< -182 rpm (Fail) > -132 rpm (Pass)	No Active DTCs:	Motor speed faults: P0A3F, P1B03, P0A40, P16EB, P1E0A	Fail Condition: 1 loop execution at 100 ms rate 100 ms Pass condition: 10.00 seconds	Type B, 2 Trips
					No Active DTCs:	Vehicle Speed/TOS sensor faults: P0722, P0723, P077B, P077D, U0101, U0073		
					No Active DTCs:	Fuel Level Faults: P0128, P0461, P0462, P0463, P2066, P2067, P2068		
					No Active DTCs:	Engine Coolant Temperature Faults: P0116, P0117, P0118, P0119, P111E		
					No Active DTCs	ECM CAN Communication: U0100		
					Low Fuel Condition	FALSE		
					Accelerator pedal position	<= 1.00 %		
					Engine State	Running (not starting or stopping states)		
					Vehicle Speed	<= 2 kph		
					Engine Coolant	>= 60.00 Deg C		
					Commanded RPM Delta	< 25.00 RPM		
					Hybrid Speed Control Active	>= 3.00 seconds		
					Idle Conditons Present (all conditions listed above are true)	>= 5.00 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Voltage Low	P0562	This diagnostic detects low voltage in the vehicle's 12 volt system. The fault sets when the THCP detects supply voltage below the indicated threshold for the indicated time.	Arbitrated battery voltage level is low	≤ 10.00 Volts	Enable Calibration is True 12V Starter Engaged Run crank active Engine Speed	= 1.00 (1 is Enabled) = False = 1.00 (1 is enabled) ≥ 350.00 RPM	400.00 fail counts of 500.00 samples, or fails in 5s out of 6.25s Max fail time of 6.25s Run rate at 12.5ms	Type C, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Voltage High	P0563	This diagnostic detects high voltage in the vehicle's 12 volt system. The fault sets when the host controller detects supply voltage above the indicated threshold for the indicated time.	Ignition Voltage is over limit	≥ 16.00 Volts	Enable Calibration is True Ignition Run/Crank Voltage	= 1.00 (1 is Enabled) > 5.0 Volts	400.00 fail counts out of 500.00 , or fails in 5s out of 6.25s Max fail time of 6.25s Run rate at 12.5ms	Type C, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit Range/ Performance	P057B	This diagnostic monitors the Brake Pedal Position Sensor for a stuck in range failure. The maximum brake pedal position sensor value change is observed over a period when the brake pedal is expected to move (during a shift from park to drive). If the change in brake pedal position is below a threshold for a certain number of tests, the diagnostic will fail. This diagnostic uses an EWMA for fault maturation.	Brake pedal position difference is calculated, and a score is calculated from supporting table **P057B KtBRKI_K_CmpltTestPointWeight** This score is then applied to a total score, but is only allowed to affect the total score by a factor of 0.40 Total score	<= 0.42 (Fail) >= 0.80 (Pass)	Run/Crank Voltage 12V Starter Motor Engaged Engine Start Pending No Active DTCs No Active DTCs Vehicle Speed Accelerator Pedal Position Shift lever in park at least once this key cycle Shift lever position Calculated brake pedal position delta sample counter	> 10.00 V FALSE FALSE Vehicle Speed Faults: P0722, P0723, P077C, P077D, U0101, U0073 Transmission Shift Lever Position Faults: P182E, P1915 >= 5.00 kph < 5.00 % TRUE != Park > 1,000.00	Each calculated difference test is 25.00 seconds (1,000.00 counts at 25 ms) 2.00 full tests must be completed before a FAIL can be reported This test runs once per key cycle	MIL: Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			PASS CRITERIA Brake pedal position difference is calculated, and a score is calculated from supporting table (Fast Test) **P057B KtBRKI_K_FastTestPointWeight** This score is then applied to a total score, but is only allowed to affect the total score by a factor of 0.40 Total score	>= 0.80 (Pass)	Run/Crank Voltage 12V Starter Motor Engaged Engine Start Pending Calculated brake pedal position delta sample counter Calculated brake pedal position delta	> 10.00 V FALSE FALSE > 50.00 counts > 8.00 %	Each calculated difference test is 1.25 seconds (50.00 counts @ 25ms) 20.00 tests must be completed before a PASS can be reported	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit Low	P057C	This diagnostic monitors the Brake Pedal Position Sensor for a voltage stuck low failure. The measured voltage is compared against an lower threshold. If the voltage is below the lower failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Measured Brake Pedal Position	< 5.00 %	Run/Crank Voltage 12V Starter Motor Engaged Engine Start Pending	> 10.00 V FALSE FALSE	20 failures out of 32.00 samples 25ms /sample 0.80 s	MIL: Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit High	P057D	This diagnostic monitors the Brake Pedal Position Sensor for a voltage stuck high failure. The voltage is compared against an upper threshold. If the percentage is above the upper failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Measured Brake Pedal Position	> 95.00 %	Run/Crank Voltage 12V Starter Motor Engaged Engine Start Pending	> 10.00 V FALSE FALSE	20.00 failures out of 32.00 samples 25ms /sample 0.80 s	MIL: Type A, 1 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Brake Pedal Position Sensor Circuit Intermittent/ Erratic	P057E	This diagnostic monitors the Brake Pedal Position Sensor for a noisy/erratic failure. The absolute difference between the current and previous brake pedal position measurement is calculated. If the absolute difference is above an upper failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Absolute Brake Pedal Position Measured Delta Over 25ms (Loop to Loop)	> 10.00 %	Run/Crank Voltage 12V Starter Motor Engaged Engine Start Pending	> 10.00 V FALSE FALSE	5.00 failures out of 20.00 samples 25ms /sample 0.50 s	MIL: Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Read Only Memory (ROM)	P0601	This Diagnostic tests ROM (flash) memory in the main micro-controller. The test checks that ROM has not changed since it was flashed in the plant. The bytes of ROM in different areas (code, calibration, HW configuration, etc.) are summed and compared to a checksum for that area. The checksum is created when the software is built and does not change over time. The DTC sets when the checksum comparison does not match for the indicated number of times. Detection time is based on the amount of address being checked (block size), run rate (12.5ms), and the amount of throughput used to make the calculations. This function runs in the background and reports a failure whenever the fail count is exceeded. Fail count clears when controller sleeps.	Calculated Checksum of the Boot ROM	≠ Expected Checksum	Controller Status ROM Checksum in Progress (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On ≠ True, done caluclating the checksum = False = True	Runs continuosly in the background Requires 5.00 fail counts detected to report a failure after the controller initialization	Type A, 1 Trips
			Calculated Checksum of the Software ROM	= TRUE	Controller Status ROM Checksum in Progress (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On ≠ True, done caluclating the checksum = False = True	Runs continuosly in the background Requires 5.00 fail counts detected to report a failure after the controller initialization	
			Calculated Checksum of the Calibration ROM	≠ Expected Checksum	Controller Status ROM Checksum in Progress (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On ≠ True, done caluclating the checksum = False = True	Runs continuosly in the background Requires 5.00 fail counts detected to report a failure after the controller initialization	
			Calculated Checksum of Torque Security Related Calibrations	≠ 4,293,578,391.00 Expected Checksum	Controller Status (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On = False = True	2 fail counts in a row OR 5.00 fail counts Fails whenever fail count	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					= Disable Calibration is False = Enable Calibration is True	= 0 (0 is Enabled) = 1 (1 is Enabled)	threshold above is met 12.5ms run rate	
			PASS CRITERIA: Boot ROM Checksum Software ROM Checksum Calibration ROM Checksum Torque Security ROM Checksum	 = Expected Checksum = Expected Checksum = Expected Checksum = Expected Checksum	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) (ROM fault AND Main SOH ROM fault latch AND 2nd SOH ROM fault latch)	= False = True = False = False = False	0 failures at initialization 0 failures detected in background 0 failures in the 12.5ms run rate (torque security checksum)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Not Programmed	P0602	This Diagnostic checks that the Main micro-controller has a valid calibration flashed into it. The controller manufacturer flashes a calibration with a particular calibration set to 1. At the vehicle plant the controller is reflashed with a valid calibration that also changes the particular calibration set to 0. The DTC sets when this is a nonzero value.	No Start Calibration is True	≠ 0.00 (1 is for No Start Condition)	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) No start remedial action is enabled Ignition status	= False = True = 1.00 = Run or Crank/PSA	Runs once at controller initialization and every 1 second there after Max fail time of 1s after fault occurs	Type A, 1 Trips
			PASS CRITERIA: No Start Calibration	= 0.00 , 0 allows start	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) No start remedial action is enabled Ignition status	= False = True = 1.00 = Run or Crank/PSA	Runs once at controller initialization and every 1 second there after	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Long Term Memory Reset	P0603	This Diagnostic tests the NonVolatile Memory (NVM) in the micro-controller for changes since the last write at power down. The bytes of various NVM sections are summed and compared to checksums for each section that were stored at the last powerdown. The DTC sets when the checksum comparisons do not match. Moving X of Y window for fail case 3	Static NVM Checksum at power-up	≠ Checksum at power-down	Ignition Status Enable Calibration is True	= Run or Crank = 1 (1 is Enabled)	1 failure Runs once at controller initialization	Type A, 1 Trips
			Preserved NVM Checksum at power-up	≠ Checksum at power-down	Ignition Status Enable Calibration is True	= Run or Crank = 1 (1 is Enabled)	1 failure Runs once at controller initialization	
			Power Up Reset AND BINVDM NVM Checksum at power-up	= False ≠ Checksum at power-down	Ignition Status Enable Calibration is True	= Run or Crank = 1 (1 is Enabled)	Runs once at controller initialization 3 failures out of a sample of 5 controller initializations Moving X of Y window	
			Dynamic NVM checksum at power-up AND Shutdown Finished	≠ Checksum at power-down = TRUE	Ignition Status Enable Calibration is True	= Run or Crank = 1 (1 is Enabled)	1 failure Runs once at controller initialization	
			PASS CRITERIA: Static NVM Checksum Error Dynamic NVM Checksum Error BINVDM ECC Checksum Error Preserved NVM Checksum	 = False, no error = False, no error = False, no error = False, no error	Enable Calibration is True	= 1 (1 is Enabled)	0 failures detected Runs once at controller initialization	

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	This Diagnostic tests the RAM in the micro-controller. The diagnostic checks that RAM has not changed unexpectedly. Pattern checks are done at initialization where different patterns are written and then read back. The DTC sets if the patterns do not match. Continuous checks are done while the controller is executing code that store the same variables in multiple locations. When those variables are read, a check is done to be sure both locations still match. A DTC sets if the locations do not match for the indicated time.	Secure redundant "Y" variable	≠ Primary "V" variable for greater than 125 ms	Current Time Execution - Time of Last Dual Store Error	> 25	Background loop is used to report DTC. Timers for the comparisons are updated every 1000ms Max time to fail is 1.15s	Type A, 1 Trips
			HWIO detects an illegal write to Write Protected RAM	> 65,534.00 illegal writes detected	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop Reports failure when threshold value is met Failure count remains through controller sleeps (does not clear)	
			2nd Processor State of Health RAM Fault Latched	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) Diagnostic system disabled	= False = True = False, enabled	1 count to fail Executes in Background loop every 1000ms Requires 1s to report the failure after the fault occurs	
			Main Processor State of Health RAM Fault OR 2nd Processor State Of Health RAM Fault	= True, RAM fault active = True, RAM fault active	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	1 count to fail, samples failure during initialization Fails during the controller initialization of	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							the 1st detected failure Run rate of 1s	
			HWIO detects fault in System RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	3.00 fail counts to fail test, samples failure during initialization Fails 1s after the 3rd detected failure upon initialization Run rate of 1s	
			HWIO detects fault in Cache RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	3.00 fail counts to fail test, samples failure during initialization Fails 1s after the 3rd detected failure upon initialization Run rate of 1s	
			HWIO detects fault in eTPU RAM (Timer Processing Unit)	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	3 fail counts to fail test, samples failure during initialization Fails 1s after the 3rd detected failure upon initialization Run rate of 1s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Internal Performance	P0606	This Diagnostic tests all the internal processor subsystems for faults, which suggest that the integrity of the processor cannot be trusted. Fail Case 1, 7, 8, 11, 12, 13: These diagnostics are built into the hardware of the microprocessor by the chip manufacturer. These diagnostics check the ALU and Configuration registers to ensure there have been no changes. The DTC sets if these registers have changed since the software flash at the vehicle plant. An additional built in diagnostic checks whether the top of the stack memory has changed from initialization at power up. The DTC sets if this section of memory has been detected to have changed for the indicated amount of time. Fail Case 2, 3: In case of many faults the microprocessor along with the other	HWIO detects Fault in the Stack Limit Test in the MPM, 2nd processor Indicates that the CPU Stack memory exceeded the limit "2ndStackFlt"	= HWIO detected error	Enable Calibration is True Controller shutdown transition AND Transition to Boot Software) (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) =False, not occurred =False, not occurred = False = True	1 failure after powering up controller Runs in the background	Type A, 1 Trips
			Inhibit Path Test Failed AND 2nd processor seed and key test Indicates that the Processor is not running the seed and key test (take remedial action) "2ndNotRunningSeedKyTst"	=True, inhibit path test failed =False, key is not detected	12V battery in range Vehicle Speed Remedial action shutdowns SPI Fault Run Crank Active Ram or ROM fault ALU error Stack error Seed and Key error Seed received in wrong order fault Seed/Key Timeout Powermode Off time	> 11.10 V < 0.10 kph = FALSE (None active) = FALSE (No active P0606) = FALSE = FALSE (No active P0601, P0604) = FALSE, not active = FALSE, not active = FALSE, not active = FALSE (No active P0606) = FALSE < 45.00 s	Executes in a 12.5ms loop 3.00 fail counts. Failure recorded, if present, once per controller initialization Once the 3rd fail count is reached and processed on key-down (engine crank to vehicle off), the remedial action is taken on the next key-up.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		microprocessors need to take remedial action to directly take the vehicle to a safe state. This fail case tests at powerdown that the microprocessors can take those remedial actions effectively. Potential failures can include memory, software, processor and Arithmatic Logic Unit (ALU) faults. The diagnostic runs by setting different controller inputs and the outputs are checked in each case across all of the microprocessors . The DTC sets when the outputs are not as expected for the indicated number of tests. Fail Case 4, 5, 6, 9, 10: The microprocessors in the ECU monitor that each of the others is executing code correctly and in a timely manner. These fail cases rely on a seed and key interaction where one micro-controller sends a seed and a second controller runs a predefined set of calculations and responds with a key.	Inhibit Path Test Failed AND 2nd processor key detected Indicates that the Processor is not demonstrating the ability to inhibit the system (take remedial action) during the Inhibit Path Test "2ndFailsToTakeRmdlActn"	=True, inhibit test failed =True, key is not detected	12V battery in range Vehicle Speed Remedial action shutdowns SPI Fault Run Crank Active Ram or ROM fault ALU error Stack error Seed and Key error Seed received in wrong order fault Seed/Key Timeout Powermode Off time	> 11.10 V < 0.10 kph = FALSE (None active) = FALSE (No active P0606) = FALSE = FALSE (No active P0601, P0604) = FALSE, not active = FALSE, not active = FALSE, not active = FALSE (No active P0606) = FALSE < 45.00 s	Executes in a 12.5ms loop 3.00 fail counts. Failure recorded, if present, once per controller initialization Once the 3rd fail count is reached and processed on key-down (engine crank to vehicle off), the remedial action is taken on the next key-up.	
			Key Value Indicates that the Processor received incorrect key values for the associated seed values that it sent out to the secondary processor "2ndRxIncorrectKeys"	≠ expected key value	Number Of Main Processors to monitor IPT status SPI Fault Run/Crank Voltage	> 0 = Not Running = FALSE (No active P0606) >= 9.50 V	Detects in 200ms time threshold OR 2 consecutive faulty key test, which fails in 25ms Run rate of 12.5ms	
			New Seed Update Time	=No new seed (in 1s, same iin time required)	(Processors to monitor AND	> 0	Fails after 1.00 s of no new seed.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The first controller sends a seed and checks that the received key matches its lookup table value for that seed and that is was received in time. The second controller checks that the correct seed value has been received and that is in time. The DTC sets when there is a mismatch of seed or key values or the expected key or seed value is out of order or if the key or seed value has not been received in the indicated time. Fail Case 14: This diagnostic checks the analog to digital converter (ADC) in the microprocessor. If the accuracy of the ADC read of a test voltage is greater than the indicated threshold for the indicated amount of time then the DTC sets. Fail Case 15, 16: These diagnostics use microprocessor internal circuitry to detect if there are faults in the RAM or Flash memory. The checks occur at power up and will set the DTC if there are the	Indicates that the Processor did not receive a key value from the secondary processor during the expected time frame "MainDtctdSdKeyTimeout"		SPI Faults AND Seed/Key Init delay timer AND Run/Crank Voltage OR 12V Battery Voltage)	= FALSE (No active P0606) >= 1.00 s. Once this runs out, then the threshold value's timeout is in effect >= 9.50 V > 11 V	Max fail time of 1.0125s (1s timeout threshold +12.5ms loop time) Executes in a 12.5ms loop	
			Seed sequence Indicates that the Processor received key values in the incorrect order from the secondary processor "MainDtctdSdRxWrongOrdr"	≠ expected order	(Processors to monitor AND SPI Faults AND Seed/Key Init delay timer AND Run/Crank Voltage OR 12V Battery Voltage)	> 0 = FALSE (No active P0606) >= 1.00 s. Once this runs out, then the threshold value's timeout is in effect >= 9.50 V > 11 V	12.00 fail counts out of 16.00 samples, or 150ms out of 200ms Max fail time of 200ms Moving X of Y window Run rate of 12.5ms	
			HWIO detects Fault in ALU Test Indicates that the Processor detected an ALU fault in the processor "2ndALU_Flt"	= HWIO error detected	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1.00 (1 is Enabled) = False = True	2 fault counts in a row after initializing controller Fails in 12.5ms, due to two consecutive reads in same loop cycle, after fault is induced Runs continuously in 12.5ms loop	
			HWIO detects Fault in	= HWIO error detected	Enable Calibration is True	= 1.00 , enabled	2 fault counts in	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		indicated number of failures in each diagnostic. Fail Case 17: This diagnostic checks the circuitry that transfers data from Flash memory to RAM. When the data transfer is made at startup and periodically there after a set of bytes are included that can be checked. The DTC sets if these bytes in RAM are not equal to the Flash memory. Fail Case 18: This diagnostic indicates that a duty cycle has not been recorded in the processor from the HWIO detection mechanism. If the	Configuration Registry Test of MPM, 2nd Indicates that the MPM/2nd Processor detected a Configuration Register fault in the processor "2ndCfgRegFlt"		(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)		a row after initializing controller Fails in 25ms, requires two loop cycles, after fault is induced Runs continuously in 12.5ms loop	
			Program Sequence Watch Seed time Since Seed Change Indicates that the Processor detected that a program Seed was not sending for the Program Sequence Watch "MainSequenceFlt"	=Unchanged	Program Sequence Watch Enabled (KaPISD_b_ProgSeqWatchEnbl[x])	= 1.00 , enabled	0.20 s, time required for seed to change before failure is recorded Max fail is 70ms (20ms timer+ 50ms loop time) Executes in a 50ms loop after controller initialization	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		number of missed duty cycles becomes greater than the threshold limit, then the DTC sets.	Program Sequence Watch Fault on a CPU Indicates that the Processor detected that a program was ran out of sequence according to the Program Sequence Watch "MainSequenceFlt"	seed sequence ≠ expected sequence	Program Sequence Watch Enabled (KaPISD_b_ProgSeqWatchEnbl[x])	= 1.00 , enabled	3.00 fail counts out of 4.00 samples. or fails in 0.15s of 0.2s window. Max fail time of 200ms Moving X of Y window Run rate of 50ms in the background	
			HWIO detects Fault in ALU Test Indicates that the Processor detected an ALU fault in the processor "MainALU_Flt"	= HWIO detected fault	Enabled Calibration is True Diagnostic System Code Clear Requested Diagnostic System Reset Complete Run Crank Ingnition Low Voltage	= 1 (1 is Enabled) = False = True = False	2 fault counts in a row after initializing controller Fails in 25ms, due to two consecutive reads in same loop cycle, after fault is induced Runs continuously in 25ms loop	
			HWIO detects Fault in Configuration Registry Test Indicates that the Processor detected a Configuration Register fault in the processor "MainCfgRegFlt"	= HWIO detected fault	Enable Calibration is True Diagnostic System Code Clear Requested Diagnostic System Reset Complete Run Crank Ingnition Low Voltage	= 1 (1 is Enabled) = False = True = False	2 fault counts in a row after initializing controller Fails in 50ms, requires two loop cycles, after fault is induced	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Run Crank Low Voltage Crank	= False	Runs continuously in 25ms loop	
			HWIO detects Fault in the Stack Limit Test Indicates that the CPU Stack memory exceeded the limit "MainStackFlt"	= HWIO detected fault	Enable Calibration is True Diagnostic system disable (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1.00 (1 is Enabled) = False, enabled = False = True	2.00 fail counts anytime after powering up the controller Fails 200ms-end of drive cycle, once fault occurs Runs at a rate of 100ms	
			Voltage difference between expected circuit voltage and actual test circuit voltage Indicates that the Processor detected a problem with the Analog to Digital convertor test circuit "MainADC_Flt"	> 9.00 %	Enable Calibration is True AND Run/Crank Voltage (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) >= 7.00 V = False = True	3.00 fail counts out of 4.00 , or fails in 150ms out of 200ms OR Faulted state occurs for >= 0.20 seconds continuosly Standard X of Y window Runs at a rate of 50ms	
			HWIO detects Fault that the Processor detected a problem with the Flash ECC (error correction code) test circuit "FlashECC_CktTest"	= TRUE	Enable Calibration is True AND Power-Up Reset	= 1 (1 is Enabled) = TRUE	Executes once at every power up initialization 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							10.00 cycles (shutdown vehicle) Moving X of Y window	
			HWIO detects Fault that the Processor detected a problem with the RAM ECC (error correction code) test circuit "RAM_ECC_CktTest"	= TRUE	Enable Calibration is True AND Power-Up Reset	= 1 (1 is Enabled) = TRUE	Executes once at every power up initialization 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle) Moving X of Y window	
			HWIO detects Fault in Transfer Test from Flash to RAM OR HWIO detects Fault in the Memory Data From Flash Indicates that the Processor detected a problem in the data transfer from Flash memory to RAM memory "DMA_XferTest"	= TRUE = TRUE	Enable Calibration is True Diagnostic system disable (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False, enabled = False = True	1 detected failure anytime after initialization Fails in 50ms after fault occurs, until end of drive cycle Run rate of 50ms	
			HWIO detects missed motor duty cycle Indicates that a duty cycle	= HWIO error detected	(Diagnostic System Code Clear Requested AND Diagnostic System Reset	= False = True	20.00 fail counts out of 32.00 samples, or fails in 125ms out of	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			record has not been recorded in the processor "MissingMotorDutyCycle"		Complete) Diagnostic enable	 1.00 , enabled	200ms Max fail time of 200ms Run rate of 6.25ms	
			PASS CRITERIA: First ROM Test Complete AND Processor Performance System Run Time Met AND Processor Integrity Fault Lower AND Processor Integrity Fault Upper	 = True = 1 (1 is Enabled) after Controller Initialization = No Fault = No Fault	End of Test in Progress AND Diagnostic End of Trip in Progress AND Inhibit Path Test State	= True = False = Test Aborted OR Test Completed	Requires enabling condions to be met (equal the threshold value) and the secondary parameters' enable conditions are met. Passes 1s after these conditions are met. Run rate of 1000ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Torque Calculation Performance	P061B	Fail Case 1: This diagnostic tests the calculation of output torque. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated output torque value is greater than the driver's calculated torque request plus the indicated calibration. The DTC is set if the fault is present for longer than the indicated time. Fail Case 2: This diagnostic tests the calculation of output torque. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated output torque value is less than the driver's calculated torque request minus the indicated calibration. The DTC is set if the fault is present for longer than the indicated time. Fail Case 3:	Calculated Output Torque (To)	> Max of Driver's Output Torque Request plus 165.00 Nm OR 165.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Override fault calibration	>= 9.50 V >= 11.00 V = 0 (0 is false, no override)	30.00 fail counts out of 32.00 samples, or fails in 187.5ms out of 200ms window Max fail in 0.2s Moving X of Y window Run rate of 6.25ms	Type A, 1 Trips
			Calculated Output Torque (To)	< Min of Driver's Output Torque Request minus 165.00 Nm OR - 165.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Override fault calibration	>= 9.50 V >= 11.00 V = 0 (0 is false, no override)	30.00 fail counts out of 32.00 samples, or fails in 187.5ms out of 200ms window Max fail in 0.2s Moving X of Y window Run rate of 6.25ms	
			Motor A torque command	> ShortTerm motor A capacity plus 19.71 Nm OR < ShortTerm motor A capacity minus 19.71 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	30.00 fail counts out of 32.00 samples, or fails in 187.5ms out of 200ms window Max fail in 0.2s Moving X of Y window Run rate of 6.25ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		This diagnostic tests the calculation of motor A torque request. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated motor A torque request is greater than the short term motor A capacity plus the indicated threshold. The fault is also set if the calculated motor A torque is less than the motor A capacity minus the indicated threshold. The DTC is set if either fault is present for longer than the indicated time. All cases: Moving X of Y window						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Long Term Memory Performance	P062F	This Diagnostic tests specific areas of nonvolatile memory (NVM). The fault sets If the last write to nonvolatile memory was not successful or if the checksum of static NVM does not agree with the latest summation of that memory area. The NVM write and records the success or not of that write at key off and the success value is read at initiialization.	HWIO reports next write to NVM will not succeed OR HWIO reports the assembly calibration integrity check has failed	= True = True	Enable Calibration is True Controller Status	= 1 (1 is Enabled) = Initialization	1 fail count Runs once at controller initialization Failure is detected at the first controller initialization with the active fault	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5V Reference 2 Circuit	P0651	This diagnostic monitors the buffered 5V supply circuit 2. The measured percentage is compared against an upper threshold. If the percentage is above the upper failure threshold for sufficient time, the diagnostic will fail. The percentage is compared against a lower threshold. If the percentage is below the lower failure threshold for sufficient time, the diagnostic will fail. The absolute difference between the filtered percentage and the measured percentage is compared against an upper threshold. If the absolute difference is above the upper failure threshold, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	5V Supply Circuit Measured Percentage	> 92%	12V Starter Engaged	FALSE	40 failures out of 80 samples 12.5ms /sample 1 s	Type A, 1 Trips
			5V Supply Circuit Measured Percentage	< 88%	12V Starter Engaged	FALSE	40 failures out of 80 samples 12.5ms /sample 1 s	
			Absolute difference between the filtered 5V supply circuit measured percentage and the 5V supply circuit measured percentage	> 0.90	12V Starter Engaged	FALSE	40 failures out of 80 samples 12.5ms /sample 1 s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5V Reference 3 Circuit	P0697	This diagnostic monitors the buffered 5V supply circuit 3. The measured percentage is compared against an upper threshold. If the percentage is above the upper failure threshold for sufficient time, the diagnostic will fail. The percentage is compared against a lower threshold. If the percentage is below the lower failure threshold for sufficient time, the diagnostic will fail. The absolute difference between the filtered percentage and the measured percentage is compared against an upper threshold. If the absolute difference is above the upper failure threshold, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	5V Supply Circuit Measured Percentage	> 92%	12V Starter Engaged	FALSE	40 failures out of 80 samples 12.5ms /sample 1 s	Type A, 1 Trips
			5V Supply Circuit Measured Percentage	< 88%	12V Starter Engaged	FALSE	40 failures out of 80 samples 12.5ms /sample 1 s	
			Absolute difference between filtered 5V supply circuit measured percentage and the 5V supply circuit measured percentage	> 0.90	12V Starter Engaged	FALSE	40 failures out of 80 samples 12.5ms /sample 1 s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Torque Managment System - Forced Engine Shutdown	P06AF	This HCP Diagnostic checks that the ECM is processing code correctly. The ECM has a main and a secondary processor. As long as the main ECM processor responds to the secondary ECM processor correctly then the correct pattern is sent via CAN message to the HPC1. When the ECM does not have correct interaction between its two microprocessors then an incorrect pattern is sent to the HPC1, which sets the DTC. Moving X of Y window	Received pattern from the ECM OR Received malfunction pattern	≠ expected message sequence (F->5->B->D->A->6->3->0) ≠ any one of the expected messages (F, 5, B, D, A, 6, 3, 0)	Run/Crank Voltage OR Ignition Run/Crank Voltage Run Crank Active Time	>= 9.50 V >= 11.00 V >= 0.10 seconds	8.00 fail counts out of 12.00 samples, or fails in 100ms out of 150ms Max fails in 250ms after the 100ms run crank active delay timer Run rate of 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Power Supply A Circuit Low	P06B1	This diagnostic monitors the power supply voltage for resolver excitation circuit and IGBT bias circuit. The sensed voltage is compared against a out of range low threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic has both a continuous fail timer, to detect sudden failt, and standard XofY, to catch intermittent issue.	Scaled 15V IGBT Supply Voltage	< 8.80 V	Wakeup Signal Run/Crank Voltage OR Battery Voltage	ON > 9.5V In Range (> 10.00 - 11.00 V)	40.00 Fails/ 50.00 Samples at 12.5ms OR Continuous Fail Time > 0.30 seconds 0.625 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Power Supply A Circuit High	P06B2	This diagnostic monitors the power supply voltage for resolver excitation circuit and IGBT bias circuit. The sensed voltage is compared against a out of range high threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic has both a continuous fail timer, to detect sudden failt, and standard XofY, to catch intermittent issue.	Scaled 15V IGBT Supply Voltage	> 18.60 V	Wakeup Signal Run/Crank Voltage OR Battery Voltage	ON > 9.5V In Range (> 10.00 - 11.00 V)	40.00 Fails/ 50.00 Samples at 12.5ms OR Continuous Fail Time > 0.30 seconds 0.625 seconds	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit	P0A3F	This diagnostic monitors the output from the resolver circuit on the high voltage motor. The circuit observes the error between the sin and cos signals produced by the operation of the resolver. If the error is below a threshold voltage the circuit will output a status signal indicating a loss of signal. If the loss of signal status is present for a calibratable amount of time, the diagnostic will fail. This diagnostic implements a continuous fail timer, standard XofY, and retry strategy in order to mature diagnostic.	Amplitude of Sin or Cos Signal Once Resolver has indicated a fault, a retry will be initiated. If fault is maintained for diagnostic will mature. If fault recovers for then normal resolver operation will resume.	<2.3V 0.20 seconds 0.05 seconds	Wakeup Signal Resolver Initialization Delay Run/Crank Voltage Battery Voltage	ON 1.00 s > 9.50 V In Range (> 10.00 - 11.00 V)	200.00 Fails/ 1,000.00 Samples at 0.2ms OR Continuous Fail Time > 0.002 seconds within 0.01 second window 3.2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit Range/ Performance	P0A40	This diagnostic monitors the output from the resolver circuit on the high voltage motor. The circuit observes the error between the sin and cos signals produced by the operation of the resolver. If the error is above a threshold voltage, the circuit will output a status signal indicating the degradation of signal. If the degradation of signal status is present for a calibratable amount of time, the diagnostic will fail. This diagnostic implements a continuous fail timer, standard XofY, and retry strategy in order to mature diagnostic.	Sin or Cos Signal Once Resolver has indicated a fault, a retry will be initiated. If fault is maintained for diagnostic will mature. If fault recovers for then normal resolver operation will resume.	>4.0V 0.20 seconds 0.05 seconds	Wakeup Signal Resolver Initialization Delay Run/Crank Voltage Battery Voltage	ON 1.00 s > 9.50 V In Range (> 10.00 - 11.00 V)	200.00 Fails/ 1,000.00 Samples at 0.2ms OR Continuous Fail Time > 0.002 seconds within 0.01 second window 3.2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase U Current Low	P0A5E	This diagnostic monitors the sensed current on the "U" phase of the electric motor for an open circuit. When the phase angle of the stator current vector nears its peak, the absolute value of the current is then compared against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	ABS(Peak Phase Axis Current on the U phase)	< 9.00 Amps	Drive State Delay Timer Inverter State Inverter Power Stage Inverter Voltage Rotor Position Squared Current Comanded Test Not Failed This Key On	RUN > 10.00 ms ≠ Active Discharge Normal PWM > 48.00 V -30 deg < Phase Axis < +30 deg > 4,900.00 Amps^2 P0BFD, P0BE6, P0BE7, P0BE8, P0BEA, P0BEB, P0BEC	200.00 Fails/ 300.00 Samples at 2ms 0.61 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase V Current Low	P0A61	This diagnostic monitors the sensed current on the "V" phase of the electric motor for an open circuit. When the phase angle of the stator current vector nears its peak, the absolute value of the current is then compared against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail. against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Peak Phase Axis Current on the V phase	< 9.00 Amps	Drive State Delay Timer Inverter State Inverter Power Stage Inverter Voltage Rotor Position Squared Current Comanded Test Not Failed This Key On	RUN > 10.00 ms ≠ Active Discharge Normal PWM > 48.00 V -30 deg < Phase Axis < +30 deg > 4,900.00 Amps^2 P0BFD, P0BE6, P0BE7, P0BE8, P0BEA, P0BEB, P0BEC	200.00 Fails/ 300.00 Samples at 2ms 0.61 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase W Current Low	P0A64	This diagnostic monitors the sensed current on the "W" phase of the electric motor for an open circuit. When the phase angle of the stator current vector nears its peak, the absolute value of the current is then compared against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail.against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Peak Phase Axis Current on the W phase	< 9.00 Amps	Drive State Delay Timer Inverter State Inverter Power Stage Inverter Voltage Rotor Position Squared Current Comanded Test Not Failed This Key On	RUN > 10.00 ms ≠ Active Discharge Normal PWM > 48.00 V -30 deg < Phase Axis < +30 deg > 4,900.00 Amps^2 P0BFD, P0BE6, P0BE7, P0BE8, P0BEA, P0BEB, P0BEC	200.00 Fails/ 300.00 Samples at 2ms 0.61 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Inverter Performance	P0A78	This diagnostic monitors the hardware status line of IGBTs to detect desaturation fault. Hardware status line will indicate presence of internal overcurrent or undervoltage faults or loss of switching control events. If the hardware fault status is present for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY with retry strategy.	Phase A, B, or C High or Low Side IGBT After the first fail count, a retry strategy will be initiated. Retry strategy attempts to resume normal operation times, with between retry attempts, before the diagnostic will set.	DSatFltPending (Status Fault Bit) 2.00 0.03 seconds	PWM Output AND Inverter Voltage	Enabled > 40.00 V	2.00 Fails/ 500.00 Samples at 2ms 0.09 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
14V Power Module Input Current Sensor Performance	P0A87	This diagnostic monitors the 14V Power Module (APM) input current sensor for a stuck in range condition. It compares an average of the sensed current against a threshold when the APM is expected to be off. If the average current is above the failure threshold, the diagnostic will fail.	Average APM Input Current	>= 0.50 A	No Active DTCs High Voltage Battery Contactor Status	APM Input Current Sensor Circuit: P0A88, P0A89 OPEN for at least 0.625 s Then transition to PRECHARGE	Each calculated average is a minimum of 0.875 seconds (35.00 samples at 25 ms / sample) This diagnostic runs once per key cycle	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
14V Power Module Input Current Sensor OOR Low	P0A88	This diagnostic monitors the 14V Power Module (APM) Input Current Sensor for a low condition. It compares the sensed current against a threshold when the APM is expected to be on and outputing moderate to high power. If the current is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation. The X/Y values are held at the last value in-between enable condtions. Even though it is below the failure threshold for this diagnostic, zero amps is a valid current sensor reading when the APM is off. To avoid false failures, there are several enable criteria used in this diagnostic to ensure the APM is on and supplying low voltage power. Situations where the APM may be off and input current is expected to be zero amps include: APM commanded off, 12V	Measured APM Input Current	<= 0.50 A	APM On/Off Command Run/Crank Active Run/Crank Voltage Run/Crank Voltage Hood Switch Fault Active Hood Switch Status Actual Battery Voltage minus APM Target Output Voltage Low Voltage Output Target	ON TRUE >= 9.00 V <= 32.00 V FALSE CLOSED <= 0.10 V AND >= -1.00 V >= 13.00 V OR < 13.00 V for 3,600 s	640.00 failures out of 800.00 samples 25 ms /sample 20.00 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		charger attached to vehicle, APM self-disabled due to fault (APM Target Voltage >> Actual Voltage), and APM temporarily self-disabled to allow actual 12V battery voltage to decay below APM target voltage (APM Target Voltage < Actual Voltage).						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
14V Power Module Input Current Sensor OOR High	P0A89	This diagnostic monitors the 14V Power Module (APM) Input Current Sensor for a high condition. It compares the sensed current against a threshold when the APM is expected to be on. If the current is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Measured APM Input Current	>= 45.25 A	APM On/Off Command Run/Crank Active Run/Crank Voltage Run/Crank Voltage	ON TRUE >= 9.00 V <= 32.00 V	200.00 failures out of 250.00 samples 25 ms /sample 5.00 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Performance	P0A90	This diagnostic monitors engine speed and motor speed to determine if the belt connecting the motor to the engine is slipping or broken. The absolute difference between engine speed and motor speed is compared against an upper threshold. If the absolute difference is above the upper failure threshold for sufficient time, the diagnostic will fail. The diagnostic also monitors the number of small slip events observed in a drive cycle. If the number of small slip events is greater than a failure threshold for two consecutive drive cycles, the diagnostic will fail. To avoid false failures due to wet driving conditions, a minimum soak time must be achieved inbetween the consecutive drive cycles to ensure the belt had ample time to dry. A separate algorithm is used to pass the	Absolute difference between motor/generator measured speed and measured engine speed	> 1,500.00 rpm	Diagnostic System Code Clear Requested Diagnostic System Reset Complete Engine Speed CAN status No Active DTCs No Active DTCs Filtered Engine Speed Engine State	FALSE TRUE VALID Motor Speed: P0A3F, P1B03, P0A40, P16EB, P1E0A Motor Torque Achieved: P0C19 >= 200.00 rpm RUNNING or STARTING	180.00 failures out of 225.00 samples 25 ms /sample 5.625 s	Type A, 1 Trips
			Absolute difference between motor/generator measured speed and measured engine speed	> 1,000.00 rpm	Diagnostic System Code Clear Requested Diagnostic System Reset Complete Engine Speed CAN status No Active DTCs No Active DTCs Filtered Engine Speed Engine State	FALSE TRUE VALID Motor Speed: P0A3F, P1B03, P0A40, P16EB, P1E0A Motor Torque Achieved: P0C19 >= 200.00 rpm RUNNING or STARTING	80.00 failures out of 100.00 samples 25 ms /sample 2.50 s	
			Filtered difference between motor/generator	>= 350.00 rpm for time > 0.25 s	Diagnostic System Code Clear Requested	FALSE	1 count (@ 25ms) observed	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		diagnostic. To pass the diagnostic, little to no slip must be observed when the motor is applying significant torque to the belt.	measured speed and measured engine speed Filter constant 0.75	OR <= -350.00 rpm for time > 0.25 s	Diagnostic System Reset Complete Engine Speed CAN status No Active DTCs No Active DTCs Filtered Engine Speed Engine State	TRUE VALID Motor Speed: P0A3F, P1B03, P0A40, P16EB, P1E0A Motor Torque Achieved: P0C19 >= 200.00 rpm RUNNING	10.00 separate times 5.00 seconds needed between counts 10.00 counts must be seen on two successive key cycles with 1,800 second soak time in between successive key cycles	
			PASS CRITERIA MGU calculated torque AND Absolute difference between motor/generator measured speed and measured engine speed	PASS CRITERIA >= 20.00 Nm OR <= -35.00 Nm <= 250.00 rpm	PASS CRITERIA Diagnostic System Code Clear Requested Diagnostic System Reset Complete Engine Speed CAN status No Active DTCs No Active DTCs Filtered Engine Speed Engine State	PASS CRITERIA FALSE TRUE VALID Motor Speed: P0A3F, P1B03, P0A40, P16EB, P1E0A Motor Torque Achieved: P0C19 >= 200.00 rpm RUNNING	PASS CRITERIA 1.00 s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Inverter Temperature Sensor A Circuit Range/ Performance	P0AEE	This diagnostic verifies that the high voltage electric motor inverter phase "U" temperature sensor is neither inappropriately high nor low. This diagnostic compares the temperature reading from the sensor to a calculated average temperature of the vehicle. This average temperature is only calculated on key up after the vehicle has been off for a calibratable amount of time. The absolute value of the sensed temperature minus the calculated average temperature is then compared against a threshold. If the calculated delta between the sensed temperature and the calculated average temperature is above the fail threshold the diagnostic will fail. This diangostic matures as a standard XofY.	ABS(Inverter Phase U Temp- Cold Soak Average Temp)	> 10.00 degrees C	Propulsion System Inactive Run/Crank Active Cold Start Average Temperature Power Inverter Temperature Sensor Faults Not Active Time after controller intialization Vehicle cold soak average temperature	> 28,800.00 seconds = TRUE > -20.00 C P0AF0 and P0AEF > 5.00 seconds Available	50.00 Fails/ 60.00 Samples at 25ms 1.5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Inverter Temperature Sensor A Circuit Low	P0AEF	This diagnostic monitor for inverter phase U temperature sensor voltage which is out of range low. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull up resistor on the sensing board, meaning a high temperature of sensor short to ground will result in a low sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Inverter Phase U Temperature Sensor	> 150.00 degrees C	Sensor Exists WakeUp Signal	= 1.00 On	250.00 Fails/ 350.00 Samples at 25ms 8.75 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Inverter Temperature Sensor A Circuit High	P0AF0	This diagnostic monitor for inverter phase U temperature sensor voltage which is out of range high. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull up resistor on the sensing board, meaning a high temperature of sensor short to ground will result in a low sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is below the failure threshold for sufficient time, the diagnostic will fail.This diagnostic matures as a standard XofY.	Inverter Phase U Temperature Sensor	< -54.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(10.00)Nm	250.00 Fails/ 350.00 Samples at 25ms 98.75 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase U Current Sensor Offset Out-of Range	P0BE6	This diagnostic monitors the offset that is learned by the phase “U” current sensor on the high voltage electric motor. In order to ensure accurate current measurement an offset is calculated when there is no current going through the motor. The offset learn process is conducted on every key crank. The learned offset is then compared against a threshold, and if the offset value is larger than the fail threshold, the diagnostic will fail.	U phase offset current learn value	> 35.00 amps	Wakeup Signal Delay Timer Inverter Power Stage Battery Voltage Run/Crank Voltage No phase U current sensor range fault None of the following Inverter Faults present	On 0.20 Sec Open In Range (> 10.00 - 11.00 V) > 9.50 V P0BE7, P0BE8 P1AEC, P1AE9, P1AE8, P1B41, P1AF5, P1B0C	After enable conditions met, 1.00 Fail at 25msec 0.20 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase U Current Sensor Circuit Low	P0BE7	This diagnostic monitors for the "U" phase current sensor voltage which is out of range low. After the sensor output voltage is converted, the sensed current is compared against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail. This diangostic matures as a standard XofY.	U phase current sensor output at highside	< -440.00 amps	Battery Voltage OR Run/Crank Voltage	In Range (> 10.00 - 11.00 V) > 9.50 V	4.00 Fails/ 6.00 Samples at 25ms 0.15 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase U Current Sensor Circuit High	P0BE8	This diagnostic monitors for the "U" phase current sensor voltage which is out of range high. After the sensor output voltage is converted, the sensed current is compared against a threshold. If the sensed current is above the failure threshold for sufficient time, the diagnostic will fail. This diangostic matures as a standard XofY.	U phase current sensor output highside	> 440.00 amps	Battery Voltage OR Run/Crank Voltage	In Range (> 10.00 - 11.00 V) > 9.50 V	4.00 Fails/ 6.00 Samples at 25ms 0.15 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase V Current Sensor Offset Out-of Range	P0BEA	This diagnostic monitors the offset that is learned by the phase “V” current sensor on the high voltage electric motor. In order to ensure accurate current measurement an offset is calculated when there is no current going through the motor. The offset learn process is conducted on every key crank, the learned offset is then compared against a threshold, if the offset value is larger than the fail threshold the diagnostic will fail.	V phase current sensor offset learn value	> 35.00 amps	Wakeup Signal Delay Timer Inverter Power Stage Battery Voltage Run/Crank Voltage No phase U current sensor range fault None of the following Inverter Faults present	On 0.20 Sec Open In Range (> 10.00 - 11.00 V) > 9.50 V P0BEB, P0BEC P1AEC, P1AE9, P1AE8, P1B41, P1AF5, P1B0C	After enable conditions met, 1.00 Fail at 25msec 0.20 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase V Current Sensor Circuit Low	P0BEB	This diagnostic monitors for the "V" phase current sensor voltage which is out of range low. After the sensor output voltage is converted, the sensed current is compared against a threshold. If the sensed current is below the failure threshold for sufficient time, the diagnostic will fail. This diangostic matures as a standard XofY.	V phase current sensor output at highside	< -440.00 amps	Battery Voltage OR Run/Crank Voltage	In Range (> 10.00 - 11.00 V) > 9.50 V	4.00 Fails/ 6.00 Samples at 25ms 0.15 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase V Current Sensor Circuit High	P0BEC	This diagnostic monitors for the "V" phase current sensor voltage which is out of range high. After the sensor output voltage is converted, the sensed current is compared against a threshold. If the sensed current is above the failure threshold for sufficient time, the diagnostic will fail. This diangostic matures as a standard XofY.	V phase current Sensor output at highside	> 440.00 amps	Battery Voltage OR Run/Crank Voltage	In Range (> 10.00 - 11.00 V) > 9.50 V	4.00 Fails/ 6.00 Samples at 25ms 0.15 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase U-V-W Correlation	P0BFD	Because there are only 2 phase current sensors in the power inverter module, a rationality check has to be completed using other sensors in the vehicle. This diagnostic monitors Motor DC Current, APM input current, and HV battery current. The absolute value of the sum of these three currents is compared against a fail threshold. If the current sum is above the failure threshold for a sufficient period of time, the diagnostic will fail. This diangostic matures as a standard XofY.	Sum of U-V-W phase currents	≥ 40.00 amps	Raw Battery Charge Current No HV Battery Charge Current Faults Active No APM Current Sensor Fault Active No Inverter Current Sensor Fault Active Wakeup Signal Run Flag	Available P0B10, P0B11, P0AC1, P0AC2, P1EBA, P1EBB, P0AC0, P0B13 P0A87, P0A88, P0A89 P0BE6, P0BE7, P0BE8, P0BEA, P0BEB, P0BEC On = 1.00	90.00 Fails/ 96.00 Samples at 2ms 0.192 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Phase U-V-W Current Sensor Overcurrent	P0C01	This diagnostic monitors the sensed current on all three phases of the electric motor. The absolute value of the highest current phase value is then compared against a threshold. If the value is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY with retry.	U, V, or W Phase Current Sensor	> 385.00 amps	Wakeup Signal Power Stage Status None of the following inverter DTCs have Test Failed This Key On	On Normal PWM P0BFD, P0BE6, P0BE7, P0BE8, P0BEA, P0BEB, P0BEC	4.00 Fails/ 50.00 Samples at 2ms 0.1 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Inverter Power Supply Circuit/Open	P0C0B	This diagnostic monitors a hardware status line to detect loss of power supply to the gate drive board IGBT bias circuit. When the supply circuit drops below a threshold voltage, the module reports out a status of being in a Bias fault. If the Bias fault status is present for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Phase A, B, or C Power Supply	Failed (Status Fault Bit)	Run/Crank Voltage	> 7.00 V	30.00 Fails/ 32.00 Samples at 2ms 0.064 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Inverter Phase U Over Temperature	P0C11	This diagnostic monitors the inverter phase U temperature for an in-range high temperature condition. The sensed temperature is compared against a threshold. If the sensed temperature is above the failure threshold for a sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Inverter Phase U Temperature	> 115.00 degrees C	Sensor Exists DTCs not fault active DTCs not failed this key on	= 1.00 P0AEF, P0AF0 P0AEE, P190A	250.00 Fails/ 750.00 Samples at 25ms 18.75 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Torque Delivered Performance	P0C19	This diagnostic is a plausibility check that the motor torque is following the commanded torque. Potential failure modes include the motor's ability to produce torque and the torque calculation path in the microprocessor. This diagnostic tests the difference between the motor A torque command slew and the motor torque achieved. If the difference between motor A torque command slew and motor torque achieved is greater than a threshold for a calibratable amount of time, the diagnostic will set. This diagnostic will mature as a standard XofY.	ABS(filtered motor torque command- calculated motor torque achieved)	> 36.00 Nm	Inverter voltage DTCs not active AND Motor Speed Status AND Inverter Drive State AND ((Inverter current DTCs not active OR (Motor Control Mode AND Motor Temperature Fault Active))	P1AEC, P1AE8, P1AE9 ≠ Unusable = Run P0BFD, P0BE6, P0BE7, P0BE8, P0BEA, P0BEB, P0BEC Torque Control = False	30.00 Fails/ 32.00 Samples at 6.25ms 0.2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit A Low	P0C52	This diagnostic monitors the output voltage from the high voltage motor resolver circuit which is out of range low. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Resolver S13 Circuit Reference Voltage	< 0.10 V	Wakeup Signal	ON	20.00 Fails/ 30.00 Samples at 12.5ms 0.375 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit A High	P0C53	This diagnostic monitors the output voltage from the high voltage motor resolver circuit which is out of range high. The sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Resolver S13 Circuit Reference Voltage	> 4.90 V	Wakeup Signal	ON	20.00 Fails/ 30.00 Samples at 12.5ms 0.375 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit B Low	P0C5C	This diagnostic monitors the output voltage from the high voltage motor resolver circuit which is out of range low. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Resolver S24 Circuit Reference Voltage	< 0.10 V	Wakeup Signal	ON	20.00 Fails/ 30.00 Samples at 12.5ms 0.375 seconds	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit B High	P0C5D	This diagnostic monitors the output voltage from the high voltage motor resolver circuit which is out of range high. The sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Resolver S24 Circuit Reference Voltage	> 4.90 V	Wakeup Signal	ON	20.00 Fails/ 30.00 Samples at 12.5ms 0.375 seconds	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery System Discharge Time Too Long	P0C76	This diagnostic monitors the high voltage bus after contactors open to ensure sufficient drop in voltage occurs. The algorithm compares the bus voltage to a threshold several seconds after contactors open. If the bus voltage is greater than the failure threshold for two consecutive tests, the diagnostic will fail.	High voltage inverter voltage after active discharge completes	> 60 V	High voltage main contactor status	= OPEN for 3.50 seconds	2.00 failures out of 2.00 samples This test runs once per key cycle	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Pump Enable Circuit	P0CED	This diagnostic detects an OPEN on the output circuit. If the enable criteria are met and a fault is detected on the circuit, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Pump Enable line impedance to internal ground	>= 200 Kohm	System Voltage Coolant Pump Enable Run Crank Active Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = True = True > 1.00 second P2534	16.00 fails / 20.00 samples at 250ms 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Temperature Sensor Circuit Range/ Performance	P0CEF	The purpose of the rationality diagnostic is to detect and report a failure of the sensor when rationalized with other sensors in the vehicle. This diagnostic will run after the soak conditions are met. If the enable criteria are met and if the temperature difference of the compared sensors is greater than their calibrated thresholds, the fail counter will be incremented. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS.	ABS (Power Electronic Coolant Temperature - Outside Air Temperature) AND ABS (Power Electronic Coolant Temperature - Transmission Oil Temperature)	> 15.00 °C > 35.00 °C	System Voltage No active power electronic coolant temperature DTCs: No active outside air temperature DTC: No active transmission fluid temperature DTC: Power mode Test complete this trip Propulsion Off Timer Outside Air Temperature	> 10.00 V P0CF0, P0CF1, P0CF2 P0071, P0072, P0073, P0074 P0711, P0712, P0713 = Run for < 20.00 s = FALSE > 21,600.00 s >= -40.00 °C	80.00 fails / 100.00 samples at 100ms 10 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Temperature Sensor Circuit Low	P0CF0	This diagnostic detects if the temperature sensor has a out of range low circuit fault. If the enable criteria are met and the temperature sensor resistance read is below a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Sensor resistance	< 38.00 ohm	System Voltage	> 10.00 V	40.00 fails / 50.00 samples at 100ms 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Temperature Sensor Circuit High	P0CF1	This diagnostic detects if the temperature sensor has a out of range high circuit fault. If the enable criteria are met and the temperature sensor resistance read is above a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Sensor resistance	> 250,000.00 ohm	System Voltage	> 10.00 V	40.00 fails / 50.00 samples at 100ms 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Temperature Sensor Circuit Intermittent/ Erratic	P0CF2	This diagnostic detects if the temperature sensor circuit has an erratic circuit fault. The string length is the addition of absolute difference between consecutive temperature readings for a calibrated number of samples. If the string length is greater than the calibrated fail threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS (current temperature reading - temperature reading from 250 milliseconds previous)	> 95.00 °C 10 consecutive temperature sensor samples at 100ms	System Voltage	> 10.00 V	5.00 fails / 7.00 samples 7 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Control Module (TCM) Engine Speed Request Circuit	P150C	This diagnostic monitors the signal from the TCM to the main microprocessor with the engine speed request data. Potential failures include the TCM transceiver, the transmission line, the main transceiver and the processing in both microprocessors. If the TCM does not increment a counter with each message (ARC) correctly or transmit the correct protected value that the main expects, the fault is set in the main. Primary protected value is a Moving X of Y window. ARC is a fail threshold counter	Corrupted CAN frame message $19D on CAN bus B for one of the following: Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0->1->2->3->0...) ≠ Protection Value	Transmission engine speed requested diagnostic enable AND Run/Crank Active time AND Run/Crank Voltage	= 1.00 , enabled >= 0.50 seconds >= 9.50 V	12.00 fail counts out of 20.00 samples for the Protected value Max fails in 0.25s 6.00 failed ARC counts creates a fault Run rate of 12.5ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Voltage Allow Signal Circuit	P156F	This diagnostic monitors the signal from the HPC2 to the main microprocessor with the high voltage allowed data. Potential failures include the HPC2 transceiver, the transmission line, the main transceiver and the processing in both microprocessors. If the HPC2 does not increment a counter with each message (ARC) correctly, the fault is set in the main. Moving X of Y window	Corrupted CAN frame message $1D8 on CAN bus B for the following: Current ARC value	≠ Previous ARC value plus 1 (0->1->2->3->0...)	(Diagnostic system disabled AND Propulsion System Active AND Vehicle in Run AND Run/Crank Active time AND Ignition Run/Crank Voltage)	=False, it is enabled =True =True >= 0.50 seconds >= 11.00 V	26.00 fail counts out of 40.00 samples, or fails in 325ms out of 500ms Max fails in 500ms Run rate of 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Torque Delivered Circuit	P15F0	This diagnostic monitors the signal from the engine control module (ECM) to the main microprocessor with the actual engine torque data. Potential failures include the ECM transceiver, the transmission line, the main transceiver and the processing in both microprocessors. If the ECM does not increment a counter with each message (ARC) correctly or transmit the correct protected value that the main expects, the fault is set in the main. Moving X of Y window.	Corrupted CAN frame message $184 on CAN bus B for one of the following: Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0->1->2->3->0...) ≠ Protection Value	Propulsion System Active (Run/Crank Active time AND Run/Crank Voltage OR Ignition Run/Crank Voltage)	= TRUE >= 0.50 seconds after engine crank >= 9.50 V >= 11.00 V	10.00 fail counts out of 16.00 samples, or fails in 125ms of 200ms Max fail time of 200ms Run rate of 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Axle Torque Request Circuit	P15F1	This diagnostic monitors the signal from the engine control module (ECM) to the main microprocessor with commanded axle torque data. Potential failures include the ECM transceiver, the transmission line, the main transceiver and the processing in both microprocessors. If the ECM does not increment a counter with each message (ARC) correctly or transmit the correct protected value that the main expects, the fault is set in the main. Moving X of Y window.	Corrupted CAN frame message $0AA on CAN bus A for one of the following: Current ARC value OR Primary signal value	 ≠ Previous ARC value plus 1 (0->1->2->3->0...) ≠ Protection Value	Run/Crank Active time AND (Run/Crank Voltage OR Ignition Run/Crank Voltage	>= 0.20 secomds >= 9.50 V >= 11.00 V	12.00 fail counts out of 16.00 samples, or fails in 150ms out of 200ms Max fail time of 200ms Run rate of 12.5ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Crankshaft Torque Command Circuit	P15F5	This diagnostic monitors the signal from the engine control module (ECM) to the main microprocessor with commanded engine crankshaft data. Potential failures include the ECM transceiver, the transmission line, the main transceiver and the processing in both microprocessors. If the ECM does not increment a counter with each message (ARC) correctly or transmit the correct protected value that the main expects, the fault is set in the main. Moving X of Y window.	Corrupted CAN frame message $183 on CAN bus B for one of the following: Current ARC value OR Primary signal value	 ≠ Previous ARC value plus 1 (0->1->2->3->0...) ≠ Protection Value	Run/Crank Active time AND (Run/Crank Voltage OR Ignition Run/Crank Voltage)	>= 0.50 seconds >= 9.50 V >= 11.00 V	10.00 fail counts out of 16.00 samples, or fails in 125ms out of 200ms Max fail time of 200ms Run rate of 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV VICM Contactor Status Message Counter Incorrect	P15FC	This diagnostic monitors the signal from the HPC2 to the main microprocessor with contactor status signal circuit information. Potential failures include the HPC2 transceiver, the transmission line, the main transceiver and the processing in both microprocessors. If the HPC2 does not increment a counter with each message (ARC) correctly, the fault is set in the main. Moving X of Y window.	Corrupted CAN frame message $1D8 on CAN bus B for the following: Current ARC value	 ≠ Previous ARC value plus 1 (0->1->2->3->0...)	(Diagnostic system disabled AND Propulsion System Active AND Vehicle in Run AND Run/Crank Active time AND Ignition Run/Crank Voltage)	=False, it is enabled =True =True >= 0.50 seconds >= 11.00 V	10 fail counts out of 16.00 , or fails in 125ms out of 200ms Max fail time of 200ms Run rate of 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Serial Peripheral Interface Bus 2	P16E9	This diagnostic checks that the SPI communication between the main and MPM (2nd processor) is working correctly. This specifically reports errors that occur in the transmitted data from the main to the MPM or an error detected by the MPM. Potential failures could be in the microprocessors SPI handling, the transmission line or the microprocessors ability to execute code. The DTC sets if the messages are missing, the counter is not updated, or the SPI handler detects an incorrect checksum. Moving X of Y counter and fail time threshold.	CRC (Cyclic Redundant Checksum) error on receive	=True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) OR CAN communication Disabled OR Run Crank In Range Voltage AND Run Crank In Range Security Voltage AND 12V Battery Voltage	= False = True = False > 11.00 V >= 9.50 V > 11.00 V	Fails in 15 fail counts out of 16 samples, or 187.5ms of 200ms max Moving X of Y counter Run rate of 6.25ms and 12.5ms, runs for both of these rates	Type A, 1 Trips
			HWIO Received Errors AND Receiving Data in Progress	≠ 0 ≠ True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) OR CAN communication Disabled OR Run Crank In Range Voltage AND Run Crank In Range Security Voltage AND 12V Battery Voltage	= False = True = False > 11.00 V >= 9.50 V > 11.00 V	Fails in 15 fail counts out of 16 samples, or 187.5ms of 200ms max Moving X of Y counter Run rate of 6.25ms and 12.5ms, runs for both of these rates	
			No new message detected by 2nd processor	>187.5s (KeSPCD_t_MaxTimeoutSPI)	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) OR	= False = True	Fails in 187.5ms +12.5ms (worse case), or 200ms Fail time threshold type	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					CAN communication Disabled OR Run Crank In Range Voltage AND Run Crank In Range Security Voltage AND 12V Battery Voltage	= False > 11.00 V >= 9.50 V > 11.00 V	Run rate of 6.25ms and 12.5ms, runs for both of these rates	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Serial Peripheral Interface Bus 4	P16EB	This diagnostic monitors the SPI communication between the Resolver Digital Converter (RDC) and the microprocessor. When communication is lost between the RDC and microprocessor, the resolver circuit will output a status signal indicating loss of communication. If the loss of communication is present for a calibratable amount of time, the diagnostic will fail. This diagnostic implements a continuous fail timer, standard XofY, and retry strategy in order to mature diagnostic.	SPI Communication Once Resolver has indicated a fault, a retry will be initiated. If fault is maintained for diagnostic will mature. If fault recovers for then normal resolver operation will resume.	Missed SPI messages 0.20 seconds 0.05 seconds	Wakeup Signal Resolver Initialization Delay Run/Crank Voltage Battery Voltage	ON 1.00 s > 9.50 V In Range (> 10.00 - 11.00 V)	200.00 Fails/ 1,000.00 Samples at 0.2ms OR Continuous Fail Time > 0.002 seconds within 0.01 second window 3.2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Serial Peripheral Interface Bus 1	P16F0	This diagnostic checks that the SPI communication between the main and MPM (2nd processor) is working correctly. This specifically reports errors that occur in the transmitted data from the MPM to the main or an error detected by the main. Potential failures could be in the microprocessors SPI handling, the transmission line or the microprocessors ability to execute code. The DTC sets if the messages are missing, the counter is not updated, or the SPI handler detects an incorrect checksum. Moving X of Y window.	CRC error on receive Number of missing messages	=True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) OR CAN communication Disabled OR [(Run Crank In Range Voltage AND Run Crank In Range Security Voltage) AND (12V Battery Voltage OR Ignition power mode)]	= False = True = False > 11.00 V >= 9.50 V > 11.00 V = Power off	10.00 fail counts out of 15.00 samples, or fails in 125ms of 187.5ms Max fail time of 200ms (187.5ms +12.5ms) Moving X of Y window Run rate of 12.5ms	Type A, 1 Trips
			HWIO Received Errors AND Receiving Data in Progress	≠ 0 ≠ True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) OR CAN communication Disabled OR [(Run Crank In Range Voltage AND Run Crank In Range Security Voltage) AND (12V Battery Voltage OR Ignition power mode)]	= False = True = False > 11.00 V >= 9.50 V > 11.00 V = Power off	10.00 fail counts out of 15.00 samples, or fails in 125ms of 187.5ms Max fail time of 200ms (187.5ms +12.5ms) Moving X of Y counter Run rate of 12.5ms	
			Number of Missing Received Messages	> 4.00 missing messages	(Diagnostic System Code Clear Requested	= False	10.00 fail counts out of 15.00	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					AND Diagnostic System Reset Complete) OR CAN communication Disabled OR [(Run Crank In Range Voltage AND Run Crank In Range Security Voltage) AND (12V Battery Voltage OR Ignition power mode)]	 = True = False > 11.00 V >= 9.50 V > 11.00 V = Power off	samples, or fails in 125ms of 187.5ms Max fail time of 200ms (187.5ms +12.5ms) Moving X of Y window Run rate of 12.5ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Redundant Memory Performance	P16F3	This diagnostic detects RAM faults in real time for those variables that are determined to be safety critical. The DTC sets when the called variable is called and compared to its redundant variable and does not match. The fail case is for the engine torque value. Moving X of Y Window.	Engine Actual Torque Steady State WOM (Ve)	≠ Dual Stored Engine Actual Torque Steady State WOM (We)	Run Crank Voltage	>= 11.00 V	10.00 fail counts out of 16.00 samples, or fails in 125ms out of 200ms Max fail in 200ms Moving X of Y window Run rate of 12.5ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit Open	P171A	Detects when the surge accumulator control circuit is failed open	transmission surge accumulator control circuit impedance, update fail and sample count	≥ 200,000 Ohms	diagnostic monitor enable ignition voltage P171A test fail this key on	= 1 Boolean ≥ 9.50 volts = FALSE	≥ 32 fail counts out of ≥ 40 sample counts 12.5 millisecond update rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit Low	P171B	Detects when the surge accumulator control circuit is failed short to ground	transmission surge accumulator control circuit impedance, update fail and sample count	≤ 0.5 Ohms	diagnostic monitor enable ignition voltage P171B test fail this key on	= 1 Boolean ≥ 9.50 volts = FALSE	≥ 32 fail counts out of ≥ 40 sample counts 12.5 millisecond update rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit High	P171C	Detects when the surge accumulator control circuit is failed short to voltage	transmission surge accumulator control circuit impedance, update fail and sample count	≤ 0.5 Ohms	diagnostic monitor enable ignition voltage P171C test fail this key on	= 1 Boolean ≥ 9.50 volts = FALSE	≥ 6 fail counts out of ≥ 8 sample counts 12.5 millisecond update rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Accumulator System Performance	P171D	Detects when the surge accumulator system is not capable of supplying adaquate hydraulic pressure during the autostart. The diagnostic will monitor transmission clutch slip during the autostart event as the primary malfunction criteria.	Transmission turbine speed is greater than predicted turbine speed during autostart event, update initial fail count	**≥ P171D predicted turbine speed error** Refer to "Transmission Supporting Tables" for details	PRNDL state defaulted Transmission shift lever position Propulsion system active Ignition voltage Ignition voltage Transmission fluid temp Transmission fluid temp Hybrid state AutoStop duration min During autostop Engine speed was **************************** If above conditions are met then the following must occur: Turbine speed Engine speed Hydraulic pressure delay time If above conditions are met then increment time-out timer. Time-out timer Note: The initial fail	= False = Forward range A = True > 9.00 volts < 18.00 volts > 0.00 °C < 110.00 °C = Engine off ≥ 0.500 seconds < 5.0 RPM ≥ 13.0 RPM ≥ 250.0 RPM **≥ P171D hydraulic pressure delay** Refer to "Transmission Supporting Tables" for details ≤ 3.00 seconds	≥ 12 counts (initial fail count) Frequency =12.5ms Once the above counts are achieved then increment the final fail counter once. The final fail counter can only increment once per autostart event ≥ 3 counts (final fail counter) If above counter is greater than threshold then report DTC failed. Frequency = 12.5ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					counter must achieve it's fail threshold in less than the time-out time. ***************************** If vehicle is launched then:			
					Transmission gear ratio	= 4.530 1st gear ratio = 2.909 2nd gear ratio = 1.876 3rd gear ratio = 1.429 4th gear ratio = 1.000 5th gear ratio = 0.746 6th gear ratio		
					Trans 1st gear ratio	≤ 1.070 % of 1st gear ratio		
					Trans 1st gear ratio	≥ 0.950 % of 1st gear ratio		
					Trans gear ratio not 1st gear	≤ 1.070 % of gear ratio		
					Trans gear ratio not 1st gear	≥ 0.950 % of gear ratio		
					Valid transmission gear ratio achieved time	≥ 0.500 seconds		
					OR If vehicle is not launched but autostart occurs then:			
					Turbine speed	≤ 5.00 RPM		
					Turbine speed less then above threshold for	≥ 0.500 seconds		
					Note: During an autostart event the lack of hydraulic pressure will result in momentary clutch slip in			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					the C1234 clutch. After the clutch slip event, the main transmission pump and clutch will gain capacity, clutch slip will go to zero. If the vehicle is launching (moving) then a valid transmission ratio can be achieved. Or if the brake is continually applied and an autostart occurs naturally, then no ratio can be measured. In this case turbine speed will return to near zero rpm. ****************************** DTCs not fault active	 CrankSensor_FA Transmission Output Shaft Angular Velocity Validity Transmission Turbine Angular Velocity Validity Transmission Oil Temperature Validity P171A P171B P171C U0101 P182E P1915		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Inverter Phase U Temperature Sensor Erratic	P190A	This diagnostic monitors the inverter phase U temperature sensor voltage which could be intermittently high, low, or open. A rolling average of sensed temperature readings calculated over a set amount of time is compared against a threshold that has been calculated based on the stator current. If the calculated rolling average is above the calculated fail threshold for sufficient time the, the diagnostic will fail. This diangostic matures as a standard XofY.	A rolling average of temperature reading calculated over 0.38 seconds, in the form of string length. Temperature reading is taken every 25ms.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 0.13 seconds	70.00 Fails/ 95.00 Samples at 25ms 2.5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Pump Feedback Circuit High Voltage	P19FA	This diagnostic detects if the feedback has an out of range high frequency speed fault. If the enable criteria are met and the feedback speed read is above a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Pump feedback frequency	> 355.00 Hz	System Voltage Coolant Pump Enable Pump control commanded speed Pump ON Time Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = True 10.00 % < Pulse Width Modulation Duty Cycle < 90.00 % > 5.00 seconds = True > 1.00 second P2534	16.00 fails / 20.00 samples at 250ms 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Pump Feedback Circuit Low Voltage	P19FB	This diagnostic detects if the feedback has an out of range low frequency speed fault. If the enable criteria are met and the feedback speed read is below a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Pump feedback frequency	< 20.00 Hz	System Voltage Coolant Pump Enable Pump control commanded speed Pump ON Time Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = True 10.00 % < Pulse Width Modulation Duty Cycle < 90.00 % > 5.00 seconds = True > 1.00 second P2534	16.00 fails / 20.00 samples at 250ms 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Pump Feedback Circuit Performance	P19FC	The purpose of the performance diagnostic is to detect and report a failure of the component. If the enable criteria are met, the difference between the commanded speed and the component feedback speed is calculated. The speed difference is filtered and when the difference exceeds the calibrated fault threshold, the diagnostic reports a FAIL. If filtered speed difference does not exceed the calibrated fault threshold, the diagnostic reports a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Pump feedback performance fail in actuated state Filtered (command speed - feedback speed) OR Filtered (command speed - feedback speed)	 < **Pump Feedback Fault Low Threshold** > **Pump Feedback Fault High Threshold**	System Voltage Coolant Pump Enable No active power electronic pump DTCs: Pump control commanded speed Pump ON time Power electronic temperature Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = True P0CE9, P1F44, P1F45 10.00 % < Pulse Width Modulation Duty Cycle < 90.00 % > 9.00 seconds -20.00 < °C < 9,999.00 = True > 1.00 second P2534	up to 70 seconds	Type B, 2 Trips
			Pump feedback performance fail in non-actuated state Pump speed feedback RPM	 > 225.00	System Voltage Coolant Pump Enable Coolant Pump enable is False Pump feedback performance fail in actuated state Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = False > 10.00 seconds = False = True > 1.00 second P2534	24.00 fails / 32.00 samples at 250ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							8 sec	
			If the pump feedback diagnostic fail in the actuated state, the requirement to pass the diagnostic in actuated state: Filtered (command speed - feedback speed) OR Filtered (command speed - feedback speed)	> **Pump Feedback Repass Low Threshold** < **Pump Feedback Repass High Threshold**	System Voltage Coolant Pump Enable No active power electronic pump DTCs: Pump control commanded speed Pump ON time Power electronic temperature Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = True P0CE9, P1F44, P1F45 10.00 % < Pulse Width Modulation Duty Cycle < 90.00 % > 9.00 seconds -20.00 < °C < 9,999.00 = True > 1.00 second P2534	up to 96 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter/ Generator No Crank at Restart	P1A6F	This diagnostic indicates that the motor/generator was unable to start the engine and the 12V conventional starter was used.	12V starter motor used for auto-start	TRUE			1 count at 12.5ms / sample 12.5ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Sense Circuit Low Voltage	P1AE8	This diagnostic monitors the high voltage hardware summer voltage which is out of range low. The hardware summer voltage is compared against a failure threshold. If the hardware summer voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	High Voltage Hardware Summer Voltage	< 30.00 volts	Controller Initialization Run/CrankActive Contactors	Complete True Closed	15.00 Fails/ 20.00 Samples at 12.5ms 0.25 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Sense Circuit High Voltage	P1AE9	This diagnostic monitors the high voltage hardware summer voltage which is out of range high. The hardware summer voltage is compared against a failure threshold. If the hardware summer voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	High Voltage Sensor Voltage	> 190.00 volts	Controller Initialization Run/CrankActive	Complete True	15.00 Fails/ 20.00 Samples at 12.5ms 0.25 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery System Voltage	P1AEC	This diagnostic compares HV hardware summer voltage to HV Battery voltage and to the sum of the two interter midpack voltages. If voltage difference is greater than calibratable threshold, the diagnostic will set. If battery voltage is unavailable or invalid, the hardware summer voltage will only be compared against sum of the two inverter midpack voltages. This diagnostic matures as a standard XofY.	ABS(High Voltage Sensor Voltage - High Voltage Battery Voltage) OR ABS(High Voltage Sensor Voltage - sum of mid-pack voltages)	>= 39.00 volts >= 39.00 volts	No Active DTCs: Controller Initialization Contactors	P1AE8, P1AE9 Complete Closed	14.00 Fails/ 16.00 Samples at 12.5ms 0.20 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Hybrid Battery System Voltage High	P1AEE	This diagnostic monitors the total high voltage system voltage which is too high for the hardware. The sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as standard XofY with retry stategy used to mature diangostic.	High Voltage Sensor Voltage OR High Voltage Hardware Flag Overvoltage diagnostic implements retry strategy with between retry attempts.	> 140.00 Volts = True 0.03 seconds	Controller Initialization Power on Delay Complete Battery Voltage	Complete = 2.00 seconds > 7.00 V for 0.10 seconds	2.00 Fails/ 50.00 Samples at 2ms 2.03 seconds	Type A, 1 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage System Isolation Fault	P1AF0	This diagnostic monitors the high voltage bus for possible short to chassis. The high voltage positive leg is compared to the high voltage negative leg via a ratio. If the ratio falls outside of a specific window for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Isolation Ratio (Neg mid-pack voltage / Pos mid-pack voltage)	> 4.53 OR < 0.21	No Active DTCs: Controller Initialization Contactors Inverter Voltage Run Crank Active	P1AE8, P1AE9, P1AEC, P1AF5, P1B0C, P1B41 Complete Closed > 48.00 True	200.00 Fails/ 300.00 Samples at 12.5ms 2.5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit Low	P1AF4	This diagnostic monitors the high voltage bus positive leg sensor voltage which is out of range low. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Positive mid-pack voltage	< 5.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	70.00 Fails/ 100.00 Samples at 12.5ms 1.25 seconds	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit High	P1AF5	This diagnostic monitors the high voltage bus positive leg sensor voltage which is out of range high. The sensed voltage is subtracted from the total voltage. This delta is then compared against a threshold. If the delta is above the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Positive mid-pack voltage - High Voltage sensor voltage	> 10.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	70.00 Fails/ 100.00 Samples at 12.5ms 1.25 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit Loss of Tracking	P1B03	This diagnostic monitors the output from the resolver circuit on the high voltage motor. The circuit is continually calculating the position of the rotor in degrees. When the error between each sampling of position is greater than 5 degrees the circuit will output a status signal indicating a loss of tracking. If the loss of tracking status is present for a calibratable amount of time, the diagnostic will fail. This diagnostic implements a continuous fail timer, standard XofY, and retry strategy in order to mature diagnostic.	Internal Tracking Error Once Resolver has indicated a fault, a retry will be initiated. If fault is maintained for diagnostic will mature. If fault recovers for then normal resolver operation will resume.	>5 Degrees 0.20 seconds 0.05 seconds	Wakeup Signal Resolver Initialization Delay Run/Crank Voltage Battery Voltage	ON 1.00 s > 9.50 V In Range (> 10.00 - 11.00 V)	200.00 Fails/ 1,000.00 Samples at 0.2ms OR Continuous Fail Time > 0.002 seconds within 0.01 second window 3.2 seconds	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit Low	P1B0B	This diagnostic monitors the high voltage bus negative leg sensor voltage which is out of range low. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	Negative mid-pack voltage	< 5.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	70.00 Fails/ 100.00 Samples at 12.5ms 1.25 seconds	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 1 (HPC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit High	P1B0C	This diagnostic monitors the high voltage bus negative leg sensor voltage which is out of range high. The sensed voltage is subtracted from the total voltage. This delta is then compared against a threshold. If the delta is above the failure threshold for sufficient time, the diagnostic will fail.This diagnostic matures as a standard XofY.	High Voltage Negative to Ground Reading - Total High Voltage Reading from High Voltage Battery	> 10.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	70.00 Fails/ 100.00 Samples at 12.5ms 1.25 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Position Sensor Circuit Overspeed	P1B0D	This diagnostic monitors the output speed of the high voltage motor. The absolute value of the sensed speed of the motor is compared against a threshold. If the sensed speed is above the fail threshold for sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	ABS(Motor Speed)	> 20,500.00 rpm	Wakeup Signal	On	80.00 Fails/ 96.00 Samples at 12.5ms 1.2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Hybrid AC Voltage System Isolation Fault	P1B11	If one of the three motor phases loses isolation to chassis ground, the inverter negative midpack voltage will contain the high frequency voltage signature of the inverter output voltage. This diagnostic monitors the high frequency component of the negative midpack voltage measurement. The result of signal processing is the average magnitude of the high frequency component in the negative midpack voltage. If the average magnitude for the high frequency component in the negative midpack voltage is higher than a threshold, the diagnostic will fail. This diagnostic matures as a standard XofY.	AC component of Negative to Chassis voltage	> 10.00 V	(Battery Contactor Status OR Motor Control Mode) AND Inverter negative midpack voltage faults not active AND Inverter Stage Status	= Closed = Voltage Control P1AE8, P1AE9, P1AEC, P1B0B, P1B0C, P1B41 = Normal PWM	64.00 Fails/ 96.00 Samples at 2ms 0.192 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensing Performance	P1B41	This diagnostic verifies that the high voltage bus positive and negative leg sensors are neither inappropriately high nor low. It compares the sensed battery pack voltage against the sum of the high voltage positive and negative leg inverter midpack voltages. If the absolute value of the difference between the sensed battery voltage and the high voltage positive and negative leg sensors is greater than the failure threshold for a sufficient time, the diagnostic will fail. This diagnostic matures as a standard XofY.	ABS(Total High Voltage Measured By the Battery Pack - High Voltage Measured from Positve to Ground - High Voltage Measured from Negative to Ground)	≥ 39.00 V	No Active DTCs: Controller Initialization Run/Crank Active Contactors	P1AE8, P1AE9, P1AEC, P1AF4, P1AF5, P1B0B, P1B0C Complete True Closed	15.00 Fails/ 20.00 Samples at 12.5ms 0.25 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Internal Control module Torque Calculation Performance	P1E0A	This diagnostic detects a rationality error between dual path memory usage of calcuted variables or between detected values, such as torque, speed, modulation, voltage, current, and power. This is for torque safety critical values. The DTC sets when the rationality check between these variables is not within the set threshold. There are fail cases for secure vehicle speed, transmission output sensor to wheel speed sensor conversion factor, and the engine torque value.	Any one of the following can create the fault/ malfunction: Torque achieved vs calculated threshold out of range OR Torque rationality thresholds out of range OR Id Current threshold out of range OR Iq Current threshold out of range OR Current command rationality threshold out of range OR Back EMF threshold out of range OR Open loop voltage threshold out of range OR Absloute valueMod Index Square of open loop voltage threshold out of range OR Duty cycle over modulation threshold out of range OR Calculated power threshold out of range	> 55.00 Nm, value past the threshold limit > 55.00 (min) or 55.00 (max), value past the threshold limit > 184.00 A, value past the threshold limit > 238.00 A, value past the threshold limit > 55.00 Nm, value past the threshold limit > 0.001600 Nm (delta) or 100.00 rad/s, value past the threshold limit > 0.50 V, value past the threshold limit > 2.00 value past the threshold limit > 1.00 V (performance mode) or 0.30 V (over modulated) True, value past the threshold limit > 3,400.00 W, value past the threshold limit	Vehicle State	=Run, Crank/PSA not needed	28.00 fail counts out of 32.00 samples, or fails in 175ms out of 200ms Max fails in 200ms Run rate of 6.25ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR Instantaneous calculated voltage rationality threshold out of range OR Absolute error of calculated Q value rationality threshold out of range OR Motor resolver rationality threshold out of range	> 0.29 V, value past the threshold limit > 5,340.00 W, value past the threshold limit > 6,000.00 RPM or 628.31 rad/s, value past the threshold limit				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Pump Enable Circuit Low	P1F44	This diagnostic detects a Short to Ground (STG) fault on the output circuit. If the enable criteria are met and a fault is detected on the circuit, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Pump Enable circuit impedance to ground	<= 0.5 ohm	System Voltage Coolant Pump Enable Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = True = True > 1.00 second P2534	16.00 fails / 20.00 samples at 250ms 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Electronics Coolant Pump Enable Circuit High	P1F45	This diagnostic detects a Short to Voltage (STV) fault on the output circuit. If the enable criteria are met and a fault is detected on the circuit, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Pump Enable circuit impedance to voltage	<= 0.5 ohm	System Voltage Coolant Pump Enable Run Crank Enablement Run Crank Active Time No Run Crank Fault Active DTC	> 10.00 V = False = True > 1.00 second P2534	4.00 fails / 5.00 samples at 1 sec 5 sec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Switch Run/ Start Position Circuit Low	P2534	This diagnostic detects a run crank relay open circuit. The algorithm compares Run/Crank status in the hybrid control module to run/ crank status in the ECM. If Run/Crank is low in the hybrid control module and high in the ECM for a sufficient amount of time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Run Crank Line Voltage	≤ 2.0 Volts	CAN Communication ECM Run Crank Active CAN Data Diagnostic System Code Clear Requested Diagnostic System Reset Complete	Enabled Available and Active = False = True	320.00 out of 400.00 samples 25 ms / sample 10.00 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Switch Run/ Start Position Circuit High	P2535	This diagnostic detects a run crank relay short to power. The algorithm compares Run/Crank status in the hybrid control module to run/ crank status in the ECM. If Run/Crank is high in the hybrid control module and low in the ECM for a sufficient amount of time, the diagnostic will fail. This diagnostic uses a standard X/Y counter for fault maturation.	Run Crank Line Voltage	> 5.0 V	CAN Communication ECM Run Crank Active CAN Data Diagnostic System Code Clear Requested Diagnostic System Reset Complete	Enabled Available and False = False = True	200.00 failures out of 250.00 samples 25 ms /sample 6.25 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication on Bus A Off	U0073	This diagnostic detects that CAN bus A is off or is non-operational. If the host controller can not transmit on bus A in the indicated time the DTC is set.	Disconnect CAN bus A's high line from vehicle system to the device	= open circuit condition (closed circuit is normal condition)	General Enable Criteria: U0073 Normal CAN transmission on Bus A Device Control High Voltage Virtual Network Management Ignition Voltage Criteria: Ignition voltage Power Mode Off Cycle Enable Criteria: Enable Calibration is True Ignition Accessory Line and Battery Voltage General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for CAN hardware is bus OFF for	 Not Active on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 is Enabled) = Active > 9.50 > 3.00 seconds > 0.1125 seconds	4.00 failed samples of 5.00 , or fails in 25ms out of a 31.25ms window Max fail tim of 31.25ms Run rate of 6.25ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication on Bus B Off	U0074	This diagnostic detects that CAN bus B is off or is non-operational. If the host controller can not transmit on BUS B in the indicated time the DTC is set.	Disconnect CAN bus B's high line from vehicle system to the device	= open circuit condition (closed circuit is normal condition)	General Enable Criteria:		4.00 failed samples of 5.00 , or fails in 25ms out of a 31.25ms window Max fail tim of 31.25ms Run rate of 6.25ms	Type A, 1 Trips
					U0074	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus B	Enabled		
					Device Control	Not Active		
					High Voltage Virtual Network Management	Not Active		
					Ignition Voltage Criteria:			
					Ignition voltage	>= 9.50		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					Enable Calibration is True	= 1 (1 is Enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 9.50		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for	> 3.00 seconds		
					CAN hardware is bus OFF for	> 0.1125 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communicati on with ECM/PCM A	U0100	This diagnostic detects that the engine control module (ECM) has stopped sending messages on CAN bus A. If ECM message traffic is not received on Bus A by the host controller in the indicated time the DTC is set.	The expected received data length is a larger value than the actual data length. This also means the transmitted message length on the other device is smaller than the expected received data length on this device		General Enable Criteria:		≥ 0.50 seconds for Message $0AA	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus A	Enabled	≥ 2.50 seconds for Message $0C9	
					Device Control	Not Active	≥ 2.50 seconds for Message $1A1	
			Message $0AA	< 8.00 message length	High Voltage Virtual Network Management	Not Active		
			Message $0C9	< 7.00 message length	Ignition Voltage Criteria:		≥ 2.50 seconds for Message $1A3	
			Message $1A1	< 5.00 message length	Ignition voltage	>= 9.50		
			Message $1A3	< 1.00 message length			≥ 2.50 seconds for Message $1AA	
			Message $1AA	< 7.00 message length	Power Mode	= run		
			Message $1C5	< 6.00 message length	Off Cycle Enable Criteria:		≥ 2.00 seconds for Message $1C5	
			Message $287	< 3.00 message length	Enable Calibration is True	= 1 (1 indicates enabled)		
			Message $3E9	< 7.00 message length	Ignition Accessory Line and Battery Voltage	= Active	≥ 2.50 seconds for Message $287	
			Message $3FB	< 1.00 message length		> 9.50		
			Message $3FC	< 8.00 message length	General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for	> 3.0000 seconds	≥ 2.50 seconds for Message $3E9	
			Message $4A3	< 2.00 message length				
			Message $4C1	< 7.00 message length			≥ 2.50 seconds for Message $3FB	
			Message $4C7	< 2.00 message length	Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		
			Message $4F1	< 8.00 message length			≥ 2.50 seconds for Message $3FC	
			Message $589	< 7.00 message length				
					U0100	Not Active on Current Key	≥ 2.50 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					ECM	Cycle is present on the bus	for Message $4A3 ≥ 2.50 seconds for Message $4C1 ≥ 2.50 seconds for Message $4C7 ≥ 2.50 seconds for Message $4F1 ≥ 2.50 seconds for Message $589 Diagnostic runs in 6.25 ms loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With TCM	U0101	This diagnostic detects that the transmission control module (TCM) has stopped sending messages on CAN bus A. If TCM message traffic is not received by the host controller in the indicated time the DTC is set.	The expected received data length is a larger value than the actual data length. This also means the transmitted message length on the other device is smaller than the expected received data length on this device		General Enable Criteria:		≥ 2.50 seconds for Message $0C7	Type B, 2 Trips
					U0073	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus A	Enabled	≥ 2.50 seconds for Message $0F9	
					Device Control	Not Active		
			Message $0C7	< 4.00 message length	High Voltage Virtual Network Management	Not Active	≥ 2.50 seconds for Message $19D	
			Message $0F9	< 3.00 message length	Ignition Voltage Criteria:		≥ 2.50 seconds for Message $1A6	
			Message $19D	< 8.00 message length	Ignition voltage	>= 9.50		
			Message $1A6	< 1.00 message length			≥ 2.50 seconds for Message $1F5	
			Message $1F5	< 7.00 message length	Power Mode	= run		
			Message $4C9	< 2.00 message length	Off Cycle Enable Criteria:		≥ 2.50 seconds for Message $4C9	
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)	Diagnostic runs in 6.25 ms loop	
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 9.50		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for	> 3.0000 seconds		
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					not active for	> 0.4000 seconds		
					U0101	Not Active on Current Key Cycle		
					TCM	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Brake System Control Module	U0129	This diagnostic detects that the brake system control module (BSCM) has stopped sending messages on CAN bus A. If brake system control module message traffic is not received by the host controller in the indicated time the DTC is set.	The expected received data length is a larger value than the actual data length. This also means the transmitted message length on the other device is smaller than the expected received data length on this device		General Enable Criteria:		≥ 10.00 seconds for Message $0C1	Type B, 2 Trips
					U0073	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus A	Enabled	≥ 10.00 seconds for Message $0C5	
					Device Control	Not Active	≥ 10.00 seconds for Message $1FE	
			Message $0C1	< 8.00 message length	High Voltage Virtual Network Management	Not Active		
			Message $0C5	< 8.00 message length	Ignition Voltage Criteria:		≥ 0.50 seconds for Message $2F9	
			Message $1FE	< 8.00 message length	Ignition voltage	>= 9.50		
			Message $2F9	< 6.00 message length	Power Mode	= run	Diagnostic runs in 6.25 ms loop	
					Off Cycle Enable Criteria:			
					Enable Calibration is True	= 1 (1 indicates enabled)		
					Ignition Accessory Line and Battery Voltage	= Active > 9.50		
					General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for	> 3.0000 seconds		
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		
					U0129	Not Active on Current Key Cycle		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Brake System Control Module	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Hybrid Powertrain Control Module B	U179A	This diagnostic detects that Hybrid Powertrain Control Module B (HPC2) has stopped sending messages on CAN bus A. If Hybrid Powertrain Control Module B message traffic is not received by the host controller in the indicated time the DTC is set.	The expected received data length is a larger value than the actual data length. This also means the transmitted message length on the other device is smaller than the expected received data length on this device Message $3DD	< 6.00 message length	General Enable Criteria: U0073 Normal CAN transmission on Bus A Device Control High Voltage Virtual Network Management Ignition Voltage Criteria: Ignition voltage Power Mode Off Cycle Enable Criteria: Enable Calibration is True Ignition Accessory Line and Battery Voltage General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for U179A	 Not Active on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 9.50 > 3.0000 seconds > 0.4000 seconds Not Active on Current Key Cycle	≥ 0.50 seconds for Message $3DD Diagnostic runs in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					HPCM_B	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with ECM/PCM A on Bus B	U1818	This diagnostic detects that the engine control module (ECM) has stopped sending messages on CAN bus B. If ECM message traffic is not received on Bus B by the host controller in the indicated time the DTC is set.	The expected received data length is a larger value than the actual data length. This also means the transmitted message length on the other device is smaller than the expected received data length on this device		General Enable Criteria:		≥ 2.50 seconds for Message $091	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus B	Enabled	≥ 0.50 seconds for Message $183	
					Device Control	Not Active		
			Message $091	< 6.00 message length	High Voltage Virtual Network Management	Not Active	≥ 0.50 seconds for Message $184	
			Message $183	< 8.00 message length	Ignition Voltage Criteria:		≥ 0.50 seconds for Message $187	
			Message $184	< 8.00 message length	Ignition voltage	>= 9.50		
			Message $187	< 8.00 message length			≥ 2.50 seconds for Message $18C	
			Message $18C	< 8.00 message length	Power Mode	= run		
			Message $18D	< 7.00 message length	Off Cycle Enable Criteria:		≥ 2.50 seconds for Message $18D	
			Message $1C2	< 8.00 message length	Enable Calibration is True	= 1 (1 indicates enabled)		
			Message$1D4	< 2.00 message length	Ignition Accessory Line and	= Active	≥ 2.50 seconds for Message $1C2	
			Message $283	< 4.00 message length	Battery Voltage	> 9.50		
			Message $383	< 8.00 message length			≥ 2.50 seconds for Message $1D4	
			Message $489	< 2.00 message length	General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for	> 3.0000 seconds		
							≥ 0.50 seconds for Message $283	
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds	≥ 2.50 seconds for Message $383	
					U1818	Not Active on Current Key	≥ 2.50 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					ECM	Cycle is present on the bus	for Message $489 Diagnostic runs in 6.25 ms loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Hybrid Powertrain Control Module B on Bus B	U182D	This diagnostic detects that the Hybrid Powertrain Control Module B (HPC2) has stopped sending messages on CAN bus B. If Hybrid Powertrain Control Module B message traffic is not received on Bus B by the host controller in the indicated time the DTC is set.	The expected received data length is a larger value than the actual data length. This also means the transmitted message length on the other device is smaller than the expected received data length on this device Message $1D8 Message $3D5 Message $3D7 Message $3DA Message $3DB Message $3DF	< 6.00 message length < 8.00 message length < 8.00 message length < 8.00 message length < 5.00 message length < 2.00 message length	General Enable Criteria: U0074 Normal CAN transmission on Bus B Device Control High Voltage Virtual Network Management Ignition Voltage Criteria: Ignition voltage Power Mode Off Cycle Enable Criteria: Enable Calibration is True Ignition Accessory Line and Battery Voltage General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for U182D Hybrid Powertrain Control Module B (VICM)	Not Active on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 9.50 > 3.0000 seconds > 0.4000 seconds Not Active on Current Key Cycle is present on the bus	≥ 0.50 seconds for Message $1D8 ≥ 2.50 seconds for Message $3D5 ≥ 2.50 seconds for Message $3D7 ≥ 2.50 seconds for Message $3DA ≥ 2.50 seconds for Message $3DB ≥ 2.50 seconds for Message $3DF Diagnostic runs in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Voltage Low	P0562	Detects if battery input voltage is below a threshold	Battery voltage is below a threshold	≤ 9.10 volts	Engine Speed	>= 500 rpm	5,000 ms	Type C, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Read Only Memory (ROM)	P0601	See Malfunction criteria for Case Description.	Software or calibration checksum is incorrect - Case 1 - Checksum error	Calculated Checksum <> Stored Checksum			Runs at controller shutdown	Type A, 1 Trips
			Flash ECC (error correction code) Circuit Test - Case 2 - Failed detection of invalid data written to ECC	No ECC error found or wrong address			Runs once per powerup	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Not Programmed	P0602	Indicates that the Control Module needs to be programmed	'No Start' Calibration is set to true which is only available on a new un-programmed Module	'No Start Calibration'	= TRUE	Continuous	1s loop, 1 failure	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Long Term Memory Reset	P0603	Non-volatile memory checksum error	Checksum at power-up does not match checksum at power-down			Runs at battery connect OR after a controller reset OR When Battery Backed RAM failure detected OR next controller init when Failure counter increments to 1 OR Fault is active OR Test not passed since code clear OR Test failed this key on OR MIL Request is ON	2 consecutive failed samples	Type A, 1 Trips

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) Failure	P0604	RAM ECC Circuit Test	Failed validation of test data written to ECC	No ECC error found or wrong address			Runs once per power up	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Internal Performance	P0606	See Malfunction Criteria for Case Description	ALU (arithmetic logic unit) and Register Test - Case 1 - Control Module fails to execute a diagnostic test algorithm			Continuous	1s loop, 3 failures in powerup cycle	Type A, 1 Trips
			Program Sequence Counter - Case 2 - Incorrect sequence of frame executionProgram Sequence Counter	10 samples in incorrect sequence in consecutive order		Continuous	1s loop, 3 failures in powerup cycle	
			Configuration Registers Test - Case 3 - Comparison of current configuration register settings with predefined values fails	Configuration register <> predefined value		Continuous	1s loop, 3 failures in powerup cycle	
			MMU Test - Case 4 - Test of memory management related instructions fails	Fails MMU (memory management unit) instruction		Continuous	1s loop, 3 failures in powerup cycle	
			Main State of Health fault detected by Auxillary Micro			Continuous	100ms loop, 9 failures in powerup cycle	
			Stack Limits Test - Case 6 - Verifies stack usage does not exceed maximum stack size	Stack usage exceeds 100%		Continuous	1s loop, 3 failures in powerup cycle	
			Auxiliary ALU Test - Case 7 - Auxiliary microprocessor fails to run a defined diagnostic algorithm			Continuous	1s loop, 3 failures in powerup cycle	
			Auxiliary RAM Test - Case 8 - Auxiliary microprocessor fails a write/read data diagnostic RAM test			Continuous	1s loop, 3 failures in powerup cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Auxiliary ROM Test - Case 9 - Auxiliary microprocessor ROM checksum error			Continuous	1s loop, 3 failures in powerup cycle	
			Auxiliary Register Configuration Test - Case 10 - Configuration register values do not match expected pre-configured values			Continuous	1s loop, 3 failures in powerup cycle	
			Auxiliary Stack Test - Case 11 - Auxiliary microprocessor stack overflow			Continuous	1s loop, 3 failures in powerup cycle	
			Seed and Key Test - Case 12 - Seed and key test failed - invalid order, timeout, incorrect seed, incorrect key			Continuous	100ms loop, 3 failures in powerup cycle	
			Main Detected Seed Incorrect Order - Case 13 - Seed and key test failed - main microprocessor received seed from the auxiliary microprocessor out of order			Continuous	100ms loop, 3 failures in powerup cycle	
			Main Detected Unknown Seed - Case 14 - Seed and key test failed - main microprocessor received an unknown seed			Continuous	100ms loop, 3 failures in powerup cycle	
			Case 15 - ADC (analog to digital converter) tests Difference between applied test voltage and ADC measured value	 > 9%	Diagnostic Enabled AND Battery Voltage	= TRUE >= 7 V	100ms loop, 3 failures in powerup cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			In a sampled window OR Difference between applied test voltage and ADC measured value Continuous for more than	>= 0.15 sec out of 0.4 sec > 9% >= 0.20 sec				
			SPI (serial peripheral interface) A Fault Detection Test - Case 16 - SPI A fault detected			Continuous	100ms loop, 9 failures in powerup cycle	
			SPI B Fault Detection Test - Case 17 - SPI B fault detected			Continuous	100ms loop, 9 failures in powerup cycle	
			Auxillary SPI Communication faulted			Continuous	100ms loop, 9 failures in powerup cycle	
			Main buck regulator faulted	<= 4.850 V OR >= 7.026 V		Continuous	100ms loop, 3 failures in powerup cycle	
			Secondary Power supply failed	<=4.496 OR >=5.494		Continuous	100ms loop, 3 failures in powerup cycle	
			5v Reference supply failed	<=4.596 OR >=5.414		Continuous	100ms loop, 3 failures in powerup cycle	
			Secondary micro detected fault of main micro			Continuous	100ms loop, 9 failures in powerup cycle	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Long Term Memory Performance	P062F	Checks Battery Independent Non-Volatile Data Memory (BINVDM) operation	Battery independent non-volatile status update failed	>= 2 consecutive failed samples			Runs at controller shutdown and after new data is written to EEPROM (which is checked every 5 hours)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference 3 Circuit	P0697	Sets when the 5 Volt Reference 3 Circuit voltage is below a threshold or if it is above a threshold	5v Reference 3 circuit Voltage	<= 4.496 V (10% of nominal) OR >= 5.494 V (10% of nominal)	Diagnostic Enabled Battery Voltage	= TRUE >= 9.10 V	320 Failed samples within 400 samples 1 sample every 12.5ms 5000 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
5 Volt Reference 4 Circuit	P06A3	Sets when the 5 Volt Reference 4 Circuit voltage is below a threshold or if it is above a threshold	5v Reference 4 circuit Voltage	<= 4.496 V (10% of nominal) OR >= 5.494 V (10% of nominal)	Diagnostic Enabled Battery Voltage	= TRUE >= 9.10 V	320 Failed samples within 400 samples 1 sample every 12.5ms 5000 ms	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sets when the Sensor Reference Voltage E Circuit/Open	P06D2	Sets when the 12 volt reference E Circuit voltage is below a threshold or if it is above a threshold	Reference Voltage E Circuit Voltage	<= 5.446 V (55% of nominal) OR >= 19.634 V (64% of nominal)	Diagnostic Enabled Battery Voltage	= TRUE >= 9.10 V	320 Failed samples within 400 samples 1 sample every 12.5ms 5000 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Over temperature	P0A7E	This diagnostic detects if the max battery temperature is above a threshold. If the enable criteria are met and the temperature is above a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Max Battery Temperature	> 72.00 °C	No Active DTCs (Battery temperature status) Short High Short Low Performance Comunication	 P0A9E P0AC8 P0ACD P0AEB P0A9D P0AC7 P0ACC P0AEA P1E8E P1E94 U179C	80.00 fails / 100.00 samples at 100ms 10 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Pack Deterioration	P0A7F	This diagnostic monitor compares the calculated hybrid/EV battery pack power capability against a calibrated failure threshold table. The calculated battery power capability is a function of the sensed battery voltage, current, and temperature. The "minimum threshold" is the minimum battery power required to meet necessary vehicle emissions performance at ~ 30 % state of charge (SOC) at 20 C. A new battery would be expected to have reasonably large amounts of power under these conditions, and reduced power capability as the SOC or temperature drops. Because the power capability drops with decreasing SOC below the ~ 30 % point, the failure threshold is reduced proportionally with decreasing SOC from the ~ 30 % point. Above the ~ 30 % point, the failure threshold is held constant with increasing SOC. Because the power capability drops with decreasing	Calculated battery discharge power limits	< **KtBSED_P_BPD_D_EndOfLifePwrThrsh** (kW) - see Supporting Tables	Hybrid/EV Battery Temperature	< 50.00 ºC, AND > -10.00 ºC	100 failures 100 ms /sample	Type B, 2 Trips
					Hybrid/EV Battery SOC	> 30.00 %, AND < 100.00 %		
					Run Crank Active	= TRUE		
					System Voltage	> 9.10 V		
					No Active DTCs	P0AC1 P0AC2 P1EBA P0ABC P0ABD P0ABB U179C Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Performance (see Fault Bundle Page)		
					Actual battery power exceedance of power limits in terms of % overshoot multiplied by	< 80.00 %-Sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		temperature below the 20 C point, the failure threshold is reduced proportionally with decreasing temperature from the 20 C point. Above the 20 C point, the failure threshold is held constant with increasing temperature. If the calculated battery power capability falls below the failure threshold (which is a function of SOC and battery temperature) for greater than the calibrated amount of time, the diagnostic will fail. If an entire drive cycle (time betweeen rising and falling edges of Run Crank) is completed without failing, and the measured battery power exceeds the failure threshold (which is a function of SOC and temperature) for at least a calibrated amount of time, then the diagnostic will pass.			seconds of duration			
			Calculated battery charge power limits	< **KtBSED_P_BPD_C_EndOfLifePwrThrsh** (kW) - see Supporting Tables	Hybrid/EV battery Temperature	< 50.00 ºC, AND > -10.00 ºC	100 failures 100 ms /sample	
					Hybrid/EV battery SOC	> 0.00 %, AND < 60.00 %		
					Run Crank Active	= TRUE		
					System Voltage	> 9.10 V		
					No Active DTCs	P0AC1 P0AC2 P1EBA P0ABC P0ABD P0ABB U179C Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Performance (see Fault Bundle Page)		
					Actual battery power	< 80.00 %-Sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					exceedance of power limits in terms of % overshoot multiplied by seconds of duration			
			(DTC Pass) Actual battery discharge power	> **KtBSED_P_BPD_D_ MinPassPowerThrsh** (kW) for 1 second - see Supporting Tables	Hybrid/EV battery temperature	< 50.00 ºC, AND > -10.00 ºC		
					Hybrid/EV battery SOC	> 30.00 %, AND < 100.00 %		
					Run Crank Transition	True -> False		
					No failure of the discharging power limit monitor during this drive cycle			
					System Voltage	> 9.10 V		
					No Active DTCs	P0AC1 P0AC2 P1EBA P0ABC P0ABD P0ABB U179C Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Low		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						(see Fault Bundle Page) Battery Temperature Performance (see Fault Bundle Page)		
			(DTC Pass) Actual battery charge power	> **KtBSED_P_BPD_C_ MinPassPowerThrsh** (kW) for 1 second - see Supporting Tables	Hybrid/EV battery temperature	< 50.00 ºC, AND > -10.00 ºC		
					Hybrid/EV battery SOC	> 0.00 %, AND < 60.00 %		
					Run Crank Transition	True -> False		
					No failure of the discharging power limit monitor during this drive cycle			
					System Voltage	> 9.10 V		
					No Active DTCs	P0AC1 P0AC2 P1EBA P0ABC P0ABD P0ABB U179C Battery Temperature Circuit High (see Fault Bundle Page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Performance (see Fault Bundle Page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Cooling Fan 1 Control Circuit Open	P0A81	This diagnostic detects an OPEN fault on the output circuit. If the enable criteria are met and a fault is detected on the circuit, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Control Circuit Voltage	>=1.6 V and <= 5.85 V	System Voltage Fan Control Commanded Speed Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V 0.00 % < Pulse Width Modulation Duty Cycle < 10.00 % = TRUE > 1.00 second P2534, P2535	16.00 fails / 20.00 samples at 250ms 5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Cooling Fan 1 Control Circuit Low	P0A84	This diagnostic detects a Short to Ground (STG) fault on the output circuit. If the enable criteria are met and a fault is detected on the circuit, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Control Circuit Voltage	< 0.257 V	System Voltage Fan Control Commanded Speed Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V 0.00 % < Pulse Width Modulation Duty Cycle < 10.00 % = TRUE > 1.00 second P2534, P2535	16.00 fails / 20.00 samples at 250ms 5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Cooling Fan 1 Control Circuit High	P0A85	This diagnostic detects a Short to Voltage (STV) fault on the output circuit. If the enable criteria are met and a fault is detected on the circuit, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Control Circuit Voltage	> 9 V	System Voltage Fan Control Commanded Speed Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V 11.00 %< Pulse Width Modulation Duty Cycle < 100.00 % = TRUE > 1.00 second P2534, P2535	16.00 fails / 20.00 samples at 250ms 5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor A Range/ Performance	P0A9C	This diagnostic verifies that the hybrid/EV battery temperature sensor is neither inappropriately high nor low. It compares the sensed battery temperature with an average comprised of other battery temperature sensors. If the absolute value of the difference between the sensed battery temperature and the average is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the temperature input and the average of other battery temperature sensors	> 25.00 ºC	No Active DTCs	Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Erratic (see Fault Bundle Page)	50 failures out of 67 samples 25 ms 1.675 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor A Circuit Low	P0A9D	This diagnostic monitors for hybrid/EV battery pack temperature sensor voltage which is out of range low. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a high temperature or sensor short to ground will result in a low sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is above the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	> 160 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor A Circuit High	P0A9E	This diagnostic monitors for high voltage battery pack temperature sensor voltage which is out of range high. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a low temperature or an open circuit will result in a high sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is below the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	< -69 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor A Circuit Intermittent/ Erratic	P0A9F	This diagnostic monitors for a hybrid/ EV battery temperature sensor voltage which is erratic. An erratic temperature sensor can be caused by an intermittent connection which can be observed by monitoring the integrated absolute value of the change in sensor value over time. If over an evaluation period the integration is greater than a calibratable threshold then this evaluation period fails. If a calibratable number of evaluations fail, the diagnostic will fail.	Integrated absolute value of the change in sensor value in a 10 sample window	> 10	System voltage No Active DTCs	> 9.10 V U179C	4 failures out of 5 samples 100 ms /sample 500 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Positive Contactor Circuit Stuck Closed	P0AA1	The propulsion positive contactor is a high voltage relay that is used to connect the positive side of the high voltage battery to the positive side of the propulsion bus. This DTC detects when the propulsion positive contactor is stuck closed by monitoring for excessive voltage on the positive side of the propulsion bus when all contactors are commanded open for greater than a calibratable time. The calibratable time is necessary in order to guarantee that the propulsion bus has been fully discharged in order to prevent false failures.	Propulsion Positive Bus Voltage	> 21 Volts	Voltage Control Mode Propulsion Bus Voltage Sensor Propulsion Positive Bus Voltage High Voltage Battery Voltage Sensor [All Contactors OR [All Contactors AND Propulsion Bus Voltage]]	Not Active Not Failed Not Failed Not Failed Open for > 120 seconds Open < 30 % of High Voltage Battery Voltage	3 failures out of 6 samples 12.5 ms /sample 75 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Negative Contactor Circuit Stuck Closed	P0AA4	The propulsion negative contactor is a high voltage relay that is used to connect the negative side of the high voltage battery to the negative side of the propulsion bus. This DTC detects when the propulsion negative contactor is stuck closed by monitoring for excessive voltage on the negative side of the propulsion bus when all contactors are commanded open for greater than a calibratable time. The calibratable time is necessary in order to guarantee that the propulsion bus has been fully discharged in order to prevent false failures.	Propulsion Negative Bus Voltage	> 21 V	Voltage Control Mode Propulsion Bus Voltage Sensor Propulsion Negative Bus Voltage High Voltage Battery Voltage Sensor All Contactors OR [All Contactors AND Propulsion Bus Voltage]	Not Active Not Failed Not Failed Not Failed Open for > 120 seconds Open < 30 % of High Voltage Battery Voltage	4 failures out of 6 samples 12.5 ms /sample 75 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage System Isolation Fault	P0AA6	This DTC will determine if the measured resistance between the positive or negative side of the high voltage battery and chassis ground is below a threshold which indicates that the internals of the battery are no longer adequately isolated from chassis ground.	Active Isolation Resistance	< 75,000 Ohm	P0AA6 P0AA7 P0AA8 Propulsion Positive Contactor Propulsion Negative Contactor	DTC Not Active DTC Not Active DTC Not Active Open Open	Fail if last resistance measurement is below theshold AND any 5 measurements out of last 10 measurements are below resistance theshold. No more than one resistance measurement is taken per key cycle. Pass if any single resistance measurement exceeds resistance threshold	Type A, 1 Trips
			Active Isolation Resistance	< 100,000 Ohm	P0AA6 P0AA7 P0AA8 Propulsion Positive Contactor Propulsion Negative Contactor	DTC Active DTC Not Active DTC Not Active Open Open	Fail if last resistance measurement is below theshold AND any 5 measurements out of last 10 measurements are below resistance theshold. No more than one resistance measurement is taken per key cycle.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							Pass if any single resistance measurement exceeds resistance threshold	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Isolation Sensor Circuit	P0AA7	There is an Active Isolation Bias Switch to introduce an extra known resistance into the hybrid battery isolation measurement circuitry. This Active Isolation Bias Switch is used to determine active isolation resistance. This DTC verifies functionality of the switch by measuring the voltages of both Hybrid/EV Battery Pack Voltage Isolation Sensors with respect to ground while the switch is commanded on and off. Then the diagnostic monitor processes the voltage measurements through a mathematical algorithm and compares the output to a threshold value. If the output is less than the threshold value, then the Active Isolation Bias Switch is faulty.	(Hybrid/EV Battery Pack Voltage Isolation Sensor (Switch Commanded ON) - Hybrid/EV Battery Pack Voltage Isolation Sensor (Switch Commanded OFF))^2 + (Hybrid/EV Battery Pack Voltage Isolation Sensor 2 (Switch Commanded ON) - Hybrid/EV Battery Pack Voltage Isolation Sensor 2 (Switch Commanded OFF))^2	< 5 volts^2	P0AA8 P0AA9 P1E0C P1E0D P0AAA All Contactors Run/Crank	DTC Not Active DTC Not Active DTC Not Active DTC Not Active DTC Not Active Open for 8 seconds False	12.5 ms /sample 8 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Isolation Sensor Range/ Performance	P0AA8	This DTC verifies that the operational amplifier (op amp) output of the two hybrid/EV battery pack voltage isolation sensors is correct by summing the individual sensed values of the sensors and subtracting off the op amp output. If the result is greater than a threshold, then the DTC fails.	Absolute value of (Hybrid/ EV Battery Pack Voltage Isolation Sensor plus Hybrid/EV Battery Pack Voltage Isolation Sensor 2 minus High Voltage Battery Voltage)	> 5 volts	Active Isolation Bias Switch High Voltage Battery Voltage Status	Commanded Open Valid	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Isolation Sensor Circuit Low	P0AA9	This diagnostic monitors the Hybrid/EV Battery Pack Voltage Isolation Sensor for out of range low. It compares the voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Hybrid/EV Battery Pack Voltage Isolation Sensor	< 5 volts	Active Isolation Bias Switch	Commanded Open	320 failures out of 400 samples 12.5 ms /sample 5000 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Isolation Sensor Circuit High	P0AAA	This diagnostic monitors the Hybrid/EV Battery Pack Voltage Isolation Sensor for out of range high. It compares the voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Hybrid/EV Battery Pack Voltage Isolation Sensor	> 333 volts	Active Isolation Bias Switch	Commanded Open	320 failures out of 400 samples 12.5 ms /sample 5000 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Voltage Sense Circuit Rationality	P0ABB	This diagnostic verifies that the hybrid/EV battery pack voltage sensor is neither inappropriately high nor low. It compares the sensed battery pack voltage with the sum of the battery cell voltages. If the absolute value of the difference between the sensed battery pack voltage and the sum of the battery cell voltages is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the battery pack voltage and the sum of the battery cell voltages	> 10.00 V	No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle Page) Cell Voltage Circuit High (see Fault Bundle Page) Cell Voltage Circuit Open (see Fault Bundle Page)	32 failures out of 40 samples 25 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Voltage Sense Circuit Low	P0ABC	This diagnostic monitors for hybrid/EV battery pack voltage sensor voltage which is out of range low. It compares the pack voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	High voltage battery pack voltage	< 4.80 V	System Voltage	> 9.10 V	8 failures out of 10 samples 25 ms /sample 250 ms	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Voltage Sense Circuit High	P0ABD	This diagnostic monitors for hybrid/EV voltage battery pack voltage sensor voltage which is out of range high. It compares the pack voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	High voltage battery pack voltage	> 392.00 V	System Voltage	> 9.10 V	8 failures out of 10 samples 25 ms /sample 250 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Current Sensor Circuit Low	P0AC1	The hybrid/EV battery current is measured using a Hall-effect current sensor. This diagnostic monitors for battery current sensor output voltage which is out of range low. After conversion the sensed battery current is compared against a threshold. If the current is below the failure threshold for sufficient time, the diagnostic will fail.	Battery current	< -365.10 A	System Voltage	> 9.10 V	8 failures out of 10 samples 25 ms /sample 250 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Current Sensor Circuit High	P0AC2	The hybrid/EV battery current is measured using a Hall-effect current sensor. This diagnostic monitors for battery current sensor output voltage which is out of range high. After conversion the sensed battery current is compared against a threshold. If the current is above the failure threshold for sufficient time, the diagnostic will fail.	Battery current	> 274.60 A	System Voltage	> 9.10 V	8 failures out of 10 samples 25 ms /sample 250 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor B Range/ Performance	P0AC6	This diagnostic verifies that the hybrid/EV battery temperature sensor is neither inappropriately high nor low. It compares the sensed battery temperature with an average comprised of other battery temperature sensors. If the absolute value of the difference between the sensed battery temperature and the average is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the temperature input and the average of other battery temperature sensors	> 25.00 ºC	No Active DTCs	Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Erratic (see Fault Bundle Page)	50 failures out of 67 samples 25 ms 1.675 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor B Circuit Low	P0AC7	This diagnostic monitors for hybrid/EV battery pack temperature sensor voltage which is out of range low. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a high temperature or sensor short to ground will result in a low sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is above the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	> 160 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor B Circuit High	P0AC8	This diagnostic monitors for high voltage battery pack temperature sensor voltage which is out of range high. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a low temperature or an open circuit will result in a high sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is below the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	< -69 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor B Circuit Intermittent/ Erratic	P0AC9	This diagnostic monitors for a hybrid/ EV battery temperature sensor voltage which is erratic. An erratic temperature sensor can be caused by an intermittent connection which can be observed by monitoring the integrated absolute value of the change in sensor value over time. If over an evaluation period the integration is greater than a calibratable threshold then this evaluation period fails. If a calibratable number of evaluations fail, the diagnostic will fail.	Integrated absolute value of the change in sensor value in a 10 sample window	> 10	System voltage No Active DTCs	> 9.10 V U179C	4 failures out of 5 samples 100 ms /sample 500 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor C Range/ Performance	P0ACB	This diagnostic verifies that the hybrid/EV battery temperature sensor is neither inappropriately high nor low. It compares the sensed battery temperature with an average comprised of other battery temperature sensors. If the absolute value of the difference between the sensed battery temperature and the average is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the temperature input and the average of other battery temperature sensors	> 25.00 ºC	No Active DTCs	Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Erratic (see Fault Bundle Page)	50 failures out of 67 samples 25 ms 1.675 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor C Circuit Low	P0ACC	This diagnostic monitors for hybrid/EV battery pack temperature sensor voltage which is out of range low. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a high temperature or sensor short to ground will result in a low sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is above the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	> 160 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor C Circuit High	P0ACD	This diagnostic monitors for high voltage battery pack temperature sensor voltage which is out of range high. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a low temperature or an open circuit will result in a high sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is below the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	< -69 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor C Circuit Intermittent/ Erratic	P0ACE	This diagnostic monitors for a hybrid/ EV battery temperature sensor voltage which is erratic. An erratic temperature sensor can be caused by an intermittent connection which can be observed by monitoring the integrated absolute value of the change in sensor value over time. If over an evaluation period the integration is greater than a calibratable threshold then this evaluation period fails. If a calibratable number of evaluations fail, the diagnostic will fail.	Integrated absolute value of the change in sensor value in a 10 sample window	> 10	System voltage No Active DTCs	> 9.10 V U179C	4 failures out of 5 samples 100 ms /sample 500 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Positive Contactor Control Circuit	P0AD9	Diagnoses the Propulsion Positive Contactor high side PWM output for open circuit faults	Control Voltage	≥ 1.15 V AND ≤ 2.81 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps OFF	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Positive Contactor Control Circuit Low	P0ADB	Diagnoses the Propulsion Positive Contactor high side PWM output for short to ground circuit faults	Control Voltage	≤ 5.35 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps ON	20 failures out of 25 samples 12.5 ms /sample 200 ms	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Positive Contactor Control Circuit High	P0ADC	Diagnoses the Propulsion Positive Contactor high side PWM output for short to power circuit faults	Control Voltage	≥ 5.27 V AND ≤ 19.7 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps OFF	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Negative Contactor Control Circuit	P0ADD	Diagnoses the Propulsion Negative Contactor high side PWM output for open circuit faults	Control Voltage	≥ 1.15 V AND ≤ 2.81 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps OFF	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Negative Contactor Control Circuit Low	P0ADF	Diagnoses the Propulsion Negative Contactor high side PWM output for short to ground circuit faults	Control Voltage	≤ 5.35 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps ON	20 failures out of 25 samples 12.5 ms /sample 200 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Negative Contactor Control Circuit High	P0AE0	Diagnoses the Propulsion Negative Contactor high side PWM output for short to power circuit faults	Control Voltage	≥ 5.27 V AND ≤ 19.7 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps OFF	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Precharge Contactor Control Circuit	P0AE4	Diagnoses the Precharge Contactor high side driver circuit for open circuit faults.	Voltage	≥ 1.15 V AND ≤ 2.81 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amp Off	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Precharge Contactor Control Circuit Low	P0AE6	Diagnoses the the Precharge Contactor high side driver circuit for short to ground circuit faults	Voltage	≤ 5.35 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps ON	13 failures out of 16 samples 12.5 ms /sample 200 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Precharge Contactor Control Circuit High	P0AE7	Diagnoses the the Precharge Contactor high side driver circuit for short to power circuit faults	Voltage	≥ 5.27 V AND ≤ 19.7 V	12V Battery Voltage High Voltage Battery Current Command Status	> 9.1 V < 999 amps OFF	40 failures out of 50 samples 12.5 ms /sample 625 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor D Range/ Performance	P0AE9	This diagnostic verifies that the hybrid/EV battery temperature sensor is neither inappropriately high nor low. It compares the sensed battery temperature with an average comprised of other battery temperature sensors. If the absolute value of the difference between the sensed battery temperature and the average is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the temperature input and the average of other battery temperature sensors	> 25.00 ºC	No Active DTCs	Battery Temperature Circuit Low (see Fault Bundle Page) Battery Temperature Circuit High (see Fault Bundle Page) Battery Temperature Circuit Erratic (see Fault Bundle Page)	50 failures out of 67 samples 25 ms 1.675 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor D Circuit Low	P0AEA	This diagnostic monitors for hybrid/EV battery pack temperature sensor voltage which is out of range low. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a high temperature or sensor short to ground will result in a low sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is above the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	> 160 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor D Circuit High	P0AEB	This diagnostic monitors for high voltage battery pack temperature sensor voltage which is out of range high. The temperature sensor this diagnostic is monitoring is a negative temperature coefficient thermistor with a pull-up resistor on the sensing board, meaning a low temperature or an open circuit will result in a high sensed voltage. After conversion the sensed temperature is compared against a threshold. If the sensed temperature is below the failure threshold for sufficient time, the diagnostic will fail.	Battery temperature	< -69 C	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor D Circuit Intermittent/ Erratic	P0AEC	This diagnostic monitors for a hybrid/ EV battery temperature sensor voltage which is erratic. An erratic temperature sensor can be caused by an intermittent connection which can be observed by monitoring the integrated absolute value of the change in sensor value over time. If over an evaluation period the integration is greater than a calibratable threshold then this evaluation period fails. If a calibratable number of evaluations fail, the diagnostic will fail.	Integrated absolute value of the change in sensor value in a 10 sample window	> 10	System voltage No Active DTCs	> 9.10 V U179C	4 failures out of 5 samples 100 ms /sample 500 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery System Voltage Low	P0AFA	This diagnostic monitors for hybrid/EV battery pack/cell voltage too low. It is a system monitor that checks the pack voltage and each cell's voltage by comparing their values against battery temperature-dependent thresholds. It can fail if either the battery pack voltage or any cell voltage is below their respective battery temperature-dependent threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail. For safety reasons, failures of this DTC cannot be cleared with a code clear and must be cleared by a service technician using the CPID in secondary parameters. To pass, both battery pack voltage and all cell voltages must be above their respective battery temperature-dependent thresholds.	Hybrid/EV battery pack voltage	< **KtBSED_U_BUV_PackVoltThresh** (V) - see Supporting Tables	No active DTCs: DTC Clear: Must Send CPID	P0ABC P0ABD P0ABB 0x7E4 07 AE 32 0C 0C 00 00 00	320 failures out of 400 samples 25 ms /sample 10 s	Type A, 1 Trips
			Any hybrid/EV battery cell voltage	< **KtBSED_U_BUV_CellVoltThresh** (V) - see Supporting Tables	No active DTCs: DTC Clear: Must Send CPID	Cell Voltage Circuit Low (see Fault Bundle Page) Cell Voltage Circuit High (see Fault Bundle Page) Cell Voltage Circuit Open (see Fault Bundle Page) 0x7E4 07 AE 32 0C 0C 00 00 00	112 failures out of 140 samples 25 ms /sample 3.5 s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery System Voltage High	P0AFB	This diagnostic monitors for hybrid/EV battery pack/cell voltage too high. It is a system monitor that checks the pack voltage and each cell's voltage by comparing their values against battery temperature-dependent thresholds. It can fail if either the battery pack voltage or any cell voltage is above their respective battery temperature-dependent threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail. For safety reasons, failures of this DTC cannot be cleared with a code clear and must be cleared by a service technician using the CPID in secondary parameters. To pass, both battery pack voltage and all cell voltages must be below their respective battery temperature-dependent thresholds.	Hybrid/EV battery pack voltage	> **KtBSED_U_BOV_PackVoltThresh** (V) - see Supporting Tables	No active DTCs: DTC Clear: Must Send CPID	P0ABC P0ABD P0ABB 0x7E4 07 AE 32 0C 0C 00 00 00	320 failures out of 400 samples 25 ms /sample 10 s	Type A, 1 Trips
			Any hybrid/EV battery cell voltage	> **KtBSED_U_BOV_CellVoltThresh** (V) - see Supporting Tables	No active DTCs: DTC Clear: Must Send CPID	Cell Voltage Circuit Low (see Fault Bundle Page) Cell Voltage Circuit High (see Fault Bundle Page) Cell Voltage Circuit Open (see Fault Bundle Page) 0x7E4 07 AE 32 0C 0C 00 00 00	112 failures out of 140 samples 25 ms /sample 3.5 s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense A Circuit	P0B3B	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense A Circuit Range/ Performance	P0B3C	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense A Circuit Low	P0B3D	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense A Circuit High	P0B3E	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense B Circuit	P0B40	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense B Circuit Range/ Performance	P0B41	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense B Circuit Low	P0B42	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense B Circuit High	P0B43	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense C Circuit	P0B45	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense C Circuit Range/ Performance	P0B46	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense C Circuit Low	P0B47	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense C Circuit High	P0B48	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense D Circuit	P0B4A	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense D Circuit Range/ Performance	P0B4B	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense D Circuit Low	P0B4C	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense D Circuit High	P0B4D	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense E Circuit	P0B4F	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense E Circuit Range/ Performance	P0B50	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense E Circuit Low	P0B51	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense E Circuit High	P0B52	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense F Circuit	P0B54	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense F Circuit Range/ Performance	P0B55	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense F Circuit Low	P0B56	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense F Circuit High	P0B57	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense G Circuit	P0B59	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense G Circuit Range/ Performance	P0B5A	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense G Circuit Low	P0B5B	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense G Circuit High	P0B5C	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense H Circuit	P0B5E	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense H Circuit Range/ Performance	P0B5F	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense H Circuit Low	P0B60	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense H Circuit High	P0B61	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense I Circuit	P0B63	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense I Circuit Range/ Performance	P0B64	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense I Circuit Low	P0B65	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense I Circuit High	P0B66	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense J Circuit	P0B68	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense J Circuit Range/ Performance	P0B69	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense J Circuit Low	P0B6A	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense J Circuit High	P0B6B	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense K Circuit	P0B6D	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense K Circuit Range/ Performance	P0B6E	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense K Circuit Low	P0B6F	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense K Circuit High	P0B70	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense L Circuit	P0B72	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense L Circuit Range/ Performance	P0B73	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense L Circuit Low	P0B74	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense L Circuit High	P0B75	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense M Circuit	P0B77	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense M Circuit Range/ Performance	P0B78	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense M Circuit Low	P0B79	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense M Circuit High	P0B7A	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense N Circuit	P0B7C	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense N Circuit Range/ Performance	P0B7D	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense N Circuit Low	P0B7E	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense N Circuit High	P0B7F	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense O Circuit	P0B81	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense O Circuit Range/ Performance	P0B82	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense O Circuit Low	P0B83	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense O Circuit High	P0B84	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense P Circuit	P0B86	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense P Circuit Range/ Performance	P0B87	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense P Circuit Low	P0B88	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense P Circuit High	P0B89	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Q Circuit	P0B8B	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Q Circuit Range/ Performance	P0B8C	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Q Circuit Low	P0B8D	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Q Circuit High	P0B8E	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense R Circuit	P0B90	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense R Circuit Range/ Performance	P0B91	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense R Circuit Low	P0B92	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense R Circuit High	P0B93	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense S Circuit	P0B95	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense S Circuit Range/ Performance	P0B96	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense S Circuit Low	P0B97	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense S Circuit High	P0B98	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense T Circuit	P0B9A	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense T Circuit Range/ Performance	P0B9B	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample	> 0.022 V	35 failures out of 40 evaluations	Type B, 2 Trips
					No active DTCs:	Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense T Circuit Low	P0B9C	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense T Circuit High	P0B9D	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense U Circuit	P0B9F	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense U Circuit Range/ Performance	P0BA0	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense U Circuit Low	P0BA1	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense U Circuit High	P0BA2	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense V Circuit	P0BA4	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense V Circuit Range/ Performance	P0BA5	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense V Circuit Low	P0BA6	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense V Circuit High	P0BA7	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense W Circuit	P0BA9	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense W Circuit Range/ Performance	P0BAA	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense W Circuit Low	P0BAB	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense W Circuit High	P0BAC	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense X Circuit	P0BAE	This diagnostic monitors for a hybrid/ EV battery cell voltage sense line resistance which is too high (open circuit). High resistance cell sensing wires affect cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates the cell balancing gates in a test pattern after each normal cell voltage read in order to pull current through the sense wires and detect abnormal resistance. An increase in resistance manifests itself as an increase in voltage drop once the charge-balancing gate is closed. The voltage drop is used in a calculation and converted to resistance. If the resistance is above the failure threshold for sufficient time, the diagnostic will fail.	Calculated cell sense line resistance	> 30.00 Ω	System Voltage No Active DTCs	> 9.10 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense X Circuit Range/ Performance	P0BAF	This diagnostic verifies that the hybrid/EV cell voltage sensor is not stuck in range. It compares changes in sensed voltage over time with other cell sensed voltages. If sufficient samples elapse with unchanging sensor's voltage while the rest of the cell voltages are trending over time, the diagnostic will fail.	Difference in cell voltage from previous data sample to present data sample	trended at least 0.002 V in the same direction as the average cell voltage trended	Absolute difference in calculated average cell voltage from previous cell voltage data sample to present cell voltage data sample No active DTCs:	> 0.022 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page)	35 failures out of 40 evaluations	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense X Circuit Low	P0BB0	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range low. It compares the sensed cell voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage	< 0.20	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense X Circuit High	P0BB1	This diagnostic monitors for hybrid/EV battery cell voltage sensor voltage which is out of range high. It compares the sensed cell voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Cell voltage X	> 4.90 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Cooling Fan Sense Circuit Range/ Performance	P0BC8	The purpose of the performance diagnostic is to detect and report a failure of the component. If the enable criteria are met, the difference between the commanded speed and the component feedback speed is calculated. The speed difference is filtered and when the difference exceeds the calibrated fault threshold, the diagnostic reports a FAIL. If filtered speed difference does not exceed the calibrated fault threshold, the diagnostic reports a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Fan feedback performance fail in actuated state Filtered (command speed - feedback speed) OR Filtered (command speed - feedback speed)	 < **Fan Feedback Fault low Threshold** > **Fan Feedback Fault high Threshold**	System Voltage Cooling Fan Enable Fan Control Commanded Speed Fan ON Time No Active DTCs: Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V = TRUE 11.00 % <Pulse Width Modulation Duty Cycle < 90.00 % > 20.00 seconds P0A81, P0A84, P0A85, P0D64, P0D65, P0D66, P0BC9, P0BCA, P0A9C, P0A9D and P0A9E = TRUE > 1.00 second P2534, P2535	Up To 82s	Type B, 2 Trips
			Fan feedback performance fail in non-actuated state Fan speed feedback RPM	 > 250.00	System Voltage Cooling Fan Enable Fan OFF Time Fan feedback performance fail in actuated state Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V = FALSE > 20.00 seconds = FALSE = TRUE > 1.00 second P2534, P2535	24.00 fails / 32.00 samples at 250ms 8 seconds	
			Fan feedback performance fail in		System Voltage	> 9.10 V	Up To 80.5s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			actuated state Filtered (command speed - feedback speed) AND Filtered (command speed - feedback speed)	 > **Fan Feedback Repass Low Threshold** < **Fan Feedback Repass High Threshold**	Cooling Fan Enable Fan Control Commanded Speed Fan ON time No Active DTCs: Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	= TRUE 11.00 % <Pulse Width Modulation Duty Cycle < 90.00 % > 20.00 seconds P0A81, P0A84, P0A85, P0D64, P0D65, P0D66, P0BC9, P0BCA, P0A9C, P0A9D and P0A9E = TRUE > 1.00 second P2534, P2535		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Cooling Fan Sensor Circuit Low	P0BC9	This diagnostic detects if the feedback speed is out of range low. If the enable criteria are met and the feedback speed read is below a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Fan feedback frequency	< 5.00 Hz	System Voltage Cooling Fan Enable Fan control commanded speed Fan ON Time Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V = TRUE 11.00 % <Pulse Width Modulation Duty Cycle < 90.00 % > 20.00 seconds = TRUE > 1.00 second P2534, P2535	16.00 fails / 20.00 samples at 250ms 5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Pack Cooling Fan Sensor Circuit High	P0BCA	This diagnostic detects if the feedback speed is out of range high. If the enable criteria are met and the feedback speed read is above a calibrated threshold, the fail counter will increment. If the calibrated fail count threshold is met before the calibrated sample count, the diagnostic will report a FAIL and if not it will report a PASS. The diagnostic will continue to report as long as the enablement criteria are met.	Fan feedback frequency	> 90.00 Hz	System Voltage Cooling Fan Enable Fan control commanded speed Fan ON Time Run Crank Active Run Crank Active Time No Active DTCs (Run Crank Active Signal)	> 9.10 V = TRUE 11.00 % <Pulse Width Modulation Duty Cycle < 90.00 % > 20.00 seconds = TRUE > 1.00 second P2534, P2535	16.00 fails / 20.00 samples at 250ms 5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery System Precharge Time Too Long	P0C78	The precharge contactor is used to bring two high voltage circuits to the same voltage so that the propulsion contactors are prevented from damage prior to closing of the propulsion contactors. This DTC sets if the Propulsion Bus Voltage does not get within a percentage band of high voltage battery voltage within a calibratable amount of time during the precharge. If the amount of time expires without reaching the required voltage, then the DTC fails.	Propulsion Bus Voltage	Is not within 95 % of high voltage battery pack voltage at 0.700 seconds from the start of contactor precharge	High Voltage Battery Voltage Sensor Propulsion Bus Voltage Sensor Propulsion Contactor Status	Valid Valid Precharging	Executed Once Per Precharge 0.700 seconds to fail less than 0.700 to pass	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Isolation Sensor Circuit 2 Low	P1E0C	This diagnostic monitors the Hybrid/EV Battery Pack Voltage Isolation Sensor 2 for out of range low. It compares the voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Hybrid/EV Battery Pack Voltage Isolation Sensor 2	< 5 volts	Active Isolation Bias Switch	Commanded Open	320 failures out of 400 samples 12.5 ms /sample 5000 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Isolation Sensor Circuit 2 High	P1E0D	This diagnostic monitors the Hybrid/EV Battery Pack Voltage Isolation Sensor 2 for out of range high. It compares the voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Hybrid/EV Battery Pack Voltage Isolation Sensor 2	> 333 volts	Active Isolation Bias Switch	Commanded Open	320 failures out of 400 samples 12.5 ms /sample 5000 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Interface Control Module A Performance	P1E8E	This diagnostic monitors the battery interface control module for one of four microprocessor performance faults. These performance tests are not continuous monitors and instead each concurrently run once to completion on each run-crank rising or falling edge transition. (ADC digital output when analog input is saturated low) The analog to digital converter output is verified that it does not have any digital bits stuck True by reading the resulting digital value when the analog input is saturated low. The input is saturated low by connecting a negative voltage reference to its analog input. After conversion the sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the test will fail. (ADC digital output when analog input is	ADC digital output when analog input is saturated low	> 0.08 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	
			Absolute value of the difference between cell voltage input and balancing switch input	> 0.10 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True U179C	13 failures out of 15 samples 100 ms /sample 1.5 s	
			Voltage movement of cell voltage input under test Voltage movement of cell voltage inputs not under test	< 0.05 V > 0.05 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page) U179C	1 test to pass (300ms) 6 consecutive attempts to fail (1.8s)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		saturated high) The analog to digital converter output is verified that it does not have any digital bits stuck False by reading the resulting digital value when the analog input is saturated high. The input is saturated high by connecting its analog input to a voltage source which is greater than its voltage reference. After conversion the sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the test will fail. (Absolute value of the difference between cell voltage input and balancing switch input) The battery cell voltage sensing inputs are connected to high ohmage filter resistors. It takes very little parasitic current to create a voltage drop across the high resistance filter. This voltage drop will change the sensed voltage of the cell. Each cell voltage input is monitored for parasitic current						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		inducing a inappropriately large voltage drop. In order to ensure that the sensed voltage isn't too affected by parasitic current we compare the battery cell voltage sensing inputs to the voltage read through the cell balancing switch inputs when the balancing switch is open. The balance switch path has no high ohmage filter resistor and thus is less impacted by parasitic current. If the absolute difference between the voltage sensed through the regular cell voltage sense inputs and the cell balancing switch inputs is above the failure threshold for sufficient time, the test will fail. (Voltage movement of cell voltage input under test/ Voltage movement of cell voltage inputs not under test) The battery interface control module employs a multiplexer on the cell voltage sensing inputs to need only one analog to digital converter to sense all of the battery						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		cell voltages. The multiplexer may malfunction by no longer switching between the different cell voltage inputs. This would cause some battery cell voltages to go unsensed even though it does not appear so. The correct operation of the MUX is verified by using a sense wire specific current source to intrusively alter the voltage of each battery sense input in a predefined pattern. During this intrusive mode the cell voltages are monitored to verify every battery cell voltage can be observed. If a cell voltage is not altered when it should be, or is altered when it should not be, then the multiplexer is considered broken. Upon failure the test is retried a calibrated number of times. If the calibrated number of retries is exceded, the test will fail. If any of these tests fail, the diagnostic will fail. If all of these tests pass, the diagnostic will pass.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Interface Control Module A Cell Balancing Circuit	P1E92	This diagnostic monitors for a hybrid/ EV battery cell balancing gate stuck open or closed. A cell balancing gate stuck open or closed affects cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates on the periodic input received from the hybrid/EV battery cell voltage sensors, while the cell charge-balancing gates are enabled in either an “all odd-numbered gates on” or an “all even-numbered gates on” pattern. It uses these periodic cell voltage readings, as well as the normal cell voltage readings, to create a balancing circuit ratio. If the ratio is above the failure threshold for sufficient time, the diagnostic will fail.	(Cell voltage with balancing switch closed) / (Cell voltage with balancing switch open)	> 0.80	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	28 failures out of 35 samples 100 ms /sample 3.5 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module A Reference Voltage	P1E93	This diagnostic verifies that the primary battery interface control module reference voltage is neither biased inappropriately high nor low. The diagnostic senses a known voltage source (band-gap voltage source) and verifies that the sensed value is within its expected range in a non failure mode. If the sensed value is outside of the expected range for sufficient time, the diagnostic will fail.	Sensed band-gap voltage	< 1.10 V OR > 1.38 V	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Interface Control Module B Performance	P1E94	This diagnostic monitors the battery interface control module for one of four microprocessor performance faults. These performance tests are not continuous monitors and instead each concurrently run once to completion on each run-crank rising or falling edge transition. (ADC digital output when analog input is saturated low) The analog to digital converter output is verified that it does not have any digital bits stuck True by reading the resulting digital value when the analog input is saturated low. The input is saturated low by connecting a negative voltage reference to its analog input. After conversion the sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the test will fail. (ADC digital output when analog input is	ADC digital output when analog input is saturated low	> 0.08 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	
			Absolute value of the difference between cell voltage input and balancing switch input	> 0.10 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True U179C	13 failures out of 15 samples 100 ms /sample 1.5 s	
			Voltage movement of cell voltage input under test Voltage movement of cell voltage inputs not under test	< 0.05 V > 0.05 V	System Voltage Run Crank transition No Active DTCs	> 9.10 V True -> False, OR False -> True Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page) U179C	1 test to pass (300ms) 6 consecutive attempts to fail (1.8s)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		saturated high) The analog to digital converter output is verified that it does not have any digital bits stuck False by reading the resulting digital value when the analog input is saturated high. The input is saturated high by connecting its analog input to a voltage source which is greater than its voltage reference. After conversion the sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the test will fail. (Absolute value of the difference between cell voltage input and balancing switch input) The battery cell voltage sensing inputs are connected to high ohmage filter resistors. It takes very little parasitic current to create a voltage drop across the high resistance filter. This voltage drop will change the sensed voltage of the cell. Each cell voltage input is monitored for parasitic current						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		inducing a inappropriately large voltage drop. In order to ensure that the sensed voltage isn't too affected by parasitic current we compare the battery cell voltage sensing inputs to the voltage read through the cell balancing switch inputs when the balancing switch is open. The balance switch path has no high ohmage filter resistor and thus is less impacted by parasitic current. If the absolute difference between the voltage sensed through the regular cell voltage sense inputs and the cell balancing switch inputs is above the failure threshold for sufficient time, the test will fail. (Voltage movement of cell voltage input under test/ Voltage movement of cell voltage inputs not under test) The battery interface control module employs a multiplexer on the cell voltage sensing inputs to need only one analog to digital converter to sense all of the battery						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		cell voltages. The multiplexer may malfunction by no longer switching between the different cell voltage inputs. This would cause some battery cell voltages to go unsensed even though it does not appear so. The correct operation of the MUX is verified by using a sense wire specific current source to intrusively alter the voltage of each battery sense input in a predefined pattern. During this intrusive mode the cell voltages are monitored to verify every battery cell voltage can be observed. If a cell voltage is not altered when it should be, or is altered when it should not be, then the multiplexer is considered broken. Upon failure the test is retried a calibrated number of times. If the calibrated number of retries is exceded, the test will fail. If any of these tests fail, the diagnostic will fail. If all of these tests pass, the diagnostic will pass.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Interface Control Module B Cell Balancing Circuit	P1E98	This diagnostic monitors for a hybrid/ EV battery cell balancing gate stuck open or closed. A cell balancing gate stuck open or closed affects cell voltage sensing as well as the effectiveness of the charge-balancing functionality. The diagnostic operates on the periodic input received from the hybrid/EV battery cell voltage sensors, while the cell charge-balancing gates are enabled in either an “all odd-numbered gates on” or an “all even-numbered gates on” pattern. It uses these periodic cell voltage readings, as well as the normal cell voltage readings, to create a balancing circuit ratio. If the ratio is above the failure threshold for sufficient time, the diagnostic will fail.	(Cell voltage with balancing switch closed) / (Cell voltage with balancing switch open)	> 0.80	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	28 failures out of 35 samples 100 ms /sample 3.5 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module B Reference Voltage	P1E99	This diagnostic verifies that the primary battery interface control module reference voltage is neither biased inappropriately high nor low. The diagnostic senses a known voltage source (band-gap voltage source) and verifies that the sensed value is within its expected range in a non failure mode. If the sensed value is outside of the expected range for sufficient time, the diagnostic will fail.	Sensed band-gap voltage	< 1.10 V OR > 1.38 V	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Energy Control Module Hybrid/EV Battery Cell Overvoltage	P1EAB	This diagnostic monitors for hybrid/EV battery cell voltage too high. It is a system monitor that checks each cell's voltage by comparing their values collected using a secondary cell voltage sensing system against a calibratable threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail. For safety reasons, failures of this DTC cannot be cleared with a code clear and must be cleared by a service technician using the CPID in secondary parameters. To pass, both battery pack voltage and all cell voltages must be below their respective battery temperature-dependent thresholds.	Cell Voltage	> 4.50 V	No active DTC's: System Voltage DTC Clear: Must Send CPID	Cell Voltage Circuit Low (see Fault Bundle Page) Cell Voltage Circuit High (see Fault Bundle Page) Cell Voltage Circuit Open (see Fault Bundle Page) > 9.10 V 0x7E4 07 AE 32 0C 0C 00 00 00	80 failures out of 100 samples 25 ms /sample 2 seconds	Type A, 1 Trips
			Any battery interface control module response to request to NOT test overvoltage signal	= Overvoltage signal detected	Inverter voltage System Voltage No active DTC's: Run Crank Transitions to DTC Clear: Must Send CPID	> 48 V > 9.10 V Cell Voltage Circuit Low (see Fault Bundle Page) Cell Voltage Circuit High (see Fault Bundle Page) Cell Voltage Circuit Open (see Fault Bundle Page) = ON for > 5 seconds 0x7E4 07 AE 32 0C 0C 00 00 00	80 failures out of 80 samples 25 ms /sample	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Cell Overvoltage Signal/ Circuit Performance	P1EAC	This diagnostic monitors the battery interface control module's secondary voltage sensing system for its ability to detect a voltage which is too high. Each battery interface control module has the ability to enter an over voltage performance test where it applies a high voltage on its secondary voltage sensing input. These performance tests are not continuous monitors and instead are run once to completion on each run-crank rising edge transition. Upon failure the test is retried a calibrated number of times. If the calibrated number of retries is exceeded, the test will fail. If any of these tests fail, the diagnostic will fail. If all of these tests pass, the diagnostic will pass.	Any battery interface control module response to request to test overvoltage signal	= Overvoltage signal not detected > 10 seconds	Run Crank Transitions to Inverter voltage System Voltage No active DTC's:	= ON for > 5 seconds > 48 V > 9.10 V Cell Voltage Circuit Low (see Fault Bundle Page) Cell Voltage Circuit High (see Fault Bundle Page) Cell Voltage Circuit Open (see Fault Bundle Page	Failure after 4 retries without a pass 50 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Pack Current Sensor A Exceeded Learning Limit	P1EBA	The hybrid/EV battery current is measured using a Hall-effect current sensor. This diagnostic monitor verifies that the battery current sensor output voltage is neither biased inappropriately high nor low. The current sensor bias is calculated upon controller initialization when the battery contactors are open to guarantee zero current. After the bias is calculated it is compared against zero. If the absolute current bias is above the failure threshold the diagnostic will fail.	Absolute value of the current sensor bias	> 8.00 A	System Voltage High Voltage Contactor Status Charger Contactor Status No Active DTCs Runs once immediately upon each controller initilization	> 9.10 V Open Open P0AC2 P0AC1	200 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery System Contactor(s) Stuck Open	P1EC0	This DTC determines if the propulsion system contactors have opened by comparing propulsion bus voltage to high voltage battery voltage during propulsion.	Propulsion Bus Voltage	< 80 % of High Voltage Battery Voltage	Propulsion Positive Contactor Propulsion Negative Contactor Propulsion Bus Voltage High Voltage Battery Voltage 12V Battery Voltage	Closed Closed Not Faulted Not Faulted > 9.1 V	3 failures out of 6 samples 12.5 ms /sample 75 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Isolation / Impact Sensor Fault - Hybrid Battery System Contactors Open	P1F17	When the Air Bag Module detects that a crash has occurred, it requests the HPC2 to latch open all high voltage contactors for safety reasons. When the Air Bag Module is faulty and a high voltage isolation fault is present, for safety reasons it is assumed that a vehicle crash has occurred. This DTC detects when these faults have occurred and contactors are latched open for safety reasons.	Control Module Hybrid Battery Voltage System Isolation Fault (P1AF0,P1AF2, or P1E22)in HPC1	Active	Rollover or Airbag or Inertial Sensors Run/Crank	Not working ON	25 ms Once set, this DTC cannot pass. DTC passes when latch is not set.	Type A, 1 Trips
			Control Module Hybrid Battery Voltage System Isolation Fault (P1AF0,P1AF2, or P1E22)in HPC1	Active	Lost Communication with Inflatable Restraint Sensing and Diagnostic Module on Bus F (U184E) Run/Crank	Active ON	25 ms Once set, this DTC cannot pass. DTC passes when latch is not set.	
			Lost Comm with HPC1	Active	Lost Communication with Inflatable Restraint Sensing and Diagnostic Module on Bus F (U184E) Run/Crank	Active ON	25 ms Once set, this DTC cannot pass. DTC passes when latch is not set.	
			Lost Comm with HPC1 DTC Clear	Active Must Send CPID	Rollover or Airbag or Inertial Sensors Run/Crank 0x7E4 07 AE 32 01 01	Not working ON	25 ms Once set, this DTC cannot pass. DTC passes when latch is not set.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module A Voltage Sensor Circuit Low	P1FD5	The battery interface control module monitors the voltage of a group of hybrid/EV battery cells in series contained in a battery module. This diagnostic monitors for hybrid/EV battery pack module voltage sensor voltage which is out of range low. It compares the module voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Battery interface control module voltage	< 2.00 V	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module B Voltage Sensor Circuit Low	P1FD6	The battery interface control module monitors the voltage of a group of hybrid/EV battery cells in series contained in a battery module. This diagnostic monitors for hybrid/EV battery pack module voltage sensor voltage which is out of range low. It compares the module voltage against a threshold. If the voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Battery interface control module voltage	< 2.00 V	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module A Voltage Sensor Circuit High	P1FDF	The battery interface control module monitors the voltage of a group of hybrid/EV battery cells in series contained in that battery module. This diagnostic monitors for hybrid/EV battery pack module voltage sensor voltage which is out of range high. It compares the module voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Battery interface control module voltage	> 58.80 V	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module B Voltage Sensor Circuit High	P1FE0	The battery interface control module monitors the voltage of a group of hybrid/EV battery cells in series contained in that battery module. This diagnostic monitors for hybrid/EV battery pack module voltage sensor voltage which is out of range high. It compares the module voltage against a threshold. If the voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Battery interface control module voltage	> 58.80 V	System Voltage No Active DTCs	> 9.10 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module A Voltage Sensor Circuit Range/ Performance	P1FE9	The battery interface control module monitors the voltage of a group of hybrid/EV battery cells in series. This diagnostic verifies that the hybrid/EV battery pack module voltage sensor is neither inappropriately high nor low. It compares the sensed module voltage with the sum of the battery cell voltages within that module. If the absolute value of the difference between the sensed module voltage and the sum of the relevant battery cell voltages is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the module voltage and the sum of the battery cell voltages within that module	> 0.30 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) U179C	28 failures out of 35 samples 100 ms /sample 3.5 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Interface Control Module B Voltage Sensor Circuit Range/ Performance	P1FEA	The battery interface control module monitors the voltage of a group of hybrid/EV battery cells in series. This diagnostic verifies that the hybrid/EV battery pack module voltage sensor is neither inappropriately high nor low. It compares the sensed module voltage with the sum of the battery cell voltages within that module. If the absolute value of the difference between the sensed module voltage and the sum of the relevant battery cell voltages is greater than the failure threshold for sufficient time, the diagnostic will fail.	Absolute value of the difference between the module voltage and the sum of the battery cell voltages within that module	> 0.30 V	System Voltage No Active DTCs	> 9.10 V Cell Voltage Circuit Low (see Fault Bundle page) Cell Voltage Circuit Open (see Fault Bundle page) Cell Voltage Circuit High (see Fault Bundle page) U179C	28 failures out of 35 samples 100 ms /sample 3.5 s	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Switch Run/ Start Position Circuit Low	P2534	Detects Run/Crank open circuit	Run Crank Line Voltage	< 2 volts	Diagnostic Enabled CAN Communication ECM Run/Crank Active Data	= TRUE Enabled Available and Active	10 failed samples within 20 samples 1 sample every 250 ms 5000 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Switch Run/ Start Position Circuit High	P2535	Detects Run/Crank Circuit High	Run Crank Line Voltage	> 5 volts	Diagnostic Enabled CAN Communication ECM Run/Crank Active Data	= TRUE Enabled Available and False	10 failed samples within 20 samples 1 sample every 250 ms 5000 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Hood Switch Performance	P257D	Detects if the Vehicle Hood Switch is in an Electrically Invalid Range (Rationality Check)	Hood Switch Position Sensor reading within an invalid range	Within the following ranges: 67.80 % < reading <= 71.50 % 43.40 % < reading <= 45.70 % 14.60 % < reading <= 17.20 %	Diagnostic Enabled Battery System in Range Diagnostic System Disable	= TRUE = TRUE = FALSE	80 failed samples within 100 samples 1 sample every 12.5ms 1250 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Hood Switch Circuit Low Voltage	P257E	Detects if the Vehicle Hood Switch is Shorted to Ground	Hood Switch Position Sensor reading below a threshold	<= 14.60 %	Diagnostic Enabled Battery System in Range Diagnostic System Disable	= TRUE = TRUE = FALSE	80 failed samples within 100 samples 1 sample every 12.5ms 1250 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Hood Switch Circuit High Voltage	P257F	Detects if the Vehicle Hood Switch is Shorted to Battery	Hood Switch Position Sensor reading above a threshold	>= 71.50 %	Diagnostic Enabled Battery System in Range Diagnostic System Disable	= TRUE = TRUE = FALSE	80 failed samples within 100 samples 1 sample every 12.5ms 1250 ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Power Off Timer Performance	P262B	Detects a fault in the internal Control Module off-timer	The absolute value of the difference between the Control Module 'Off' Timer and Control Module 'On' Timer (both timers operating during Controller 'On') exceeds a threshold percentage	> 0.056	Diagnostic Enabled Controller 'On' Time RunCrank DTCs Not Active	= TRUE > 60 seconds =TRUE P0601, P0602, P0603, P062F, P0604 and P0606	Runs once per drive cycle (when Run/ Crank transitions from TRUE to FALSE).	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid/EV Battery Precharge Current Too High	P3061	This DTC sets if battery current remains over a threshold during precharge for a calibratable amount of time.	High Voltage Battery Current	> 3.00 Amperes	High Voltage Battery Current High Voltage Battery Voltage Contactor Status OR Charger Contactor Status	Not Faulted Not Faulted Precharging	7 consecutive failed samples 12.5 ms /sample 87.50 ms to Fail Successful Precharge to Pass	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication Bus A Off	U0073	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN Controller Interface in a Bus off state	= TRUE	Controller On ECU is sending / receiving on CAN (Battery Voltage OR Battery Voltage transition from to for time required)	= TRUE = TRUE >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	5 failures out of 5 samples 1 s loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication on Bus B Off	U0074	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN Controller interface in a Bus off state	= TRUE	Controller On ECU is sending/recieving on CAN (Battery Voltage OR Battery Voltage transition from to for time required)	= TRUE = TRUE >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	5 failures out of 5 samples 1 s loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With ECM on Bus A	U0100	Detects that CAN serial data communication has been lost with the ECM on Bus A	Messages have not been received from the ECM for a specified time	≥ 500ms	Controller On Bus A Communication Enabled Time (Battery Voltage OR Battery Voltage transition from to for time required)	= TRUE >= 5 seconds >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	Runs in 10 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Transmission Control Module	U0101	Detects that CAN serial data communication has been lost with the TCM on Bus A	Messages have not been received from the TCM for a specified time	≥ 1500ms	Controller On Bus A Communication Enabled Time (Battery Voltage OR Battery Voltage transition from to for time required)	= TRUE >= 5 seconds >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	Runs in 10ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Hybrid/EV Battery Interface Control Module A	U01A0	This diagnostic monitors the UART bus communication status between the battery systems module (BSM) and the battery interface control modules (BICM). The diagnostic monitors BICM data availability whenever the communications bus is active. The communication network between BICMs and BSM is in a daisy-chain architecture, therefore a break at any point in the communication bus results in a loss of BICM communication with the BSM. If any data is received the diagnostic will report a pass. If no data is received for greater than a calibratable amount of time the BSM will attempt to initiate the BICMs into a communications mode where the BICMs can perform their own internal communications loop back, bypassing the daisy-chain. If this is the first BICM in the daisy-chain that the BSM cannot reestablish	Intrusive test performed upon failure of DTC U179C indicated that this is the first BICM in the communication chain with which the BSM cannot regain communication with		System Voltage Active DTCs	> 9.10 V U179C	4.5 seconds	Type B, 2 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 9.10 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 9.10 V	100 ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		communication with, this diagnostic will fail.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Hybrid/EV Battery Interface Control Module B	U01A1	This diagnostic monitors the UART bus communication status between the battery systems module (BSM) and the battery interface control modules (BICM). The diagnostic monitors BICM data availability whenever the communications bus is active. The communication network between BICMs and BSM is in a daisy-chain architecture, therefore a break at any point in the communication bus results in a loss of BICM communication with the BSM. If any data is received the diagnostic will report a pass. If no data is received for greater than a calibratable amount of time the BSM will attempt to initiate the BICMs into a communications mode where the BICMs can perform their own internal communications loop back, bypassing the daisy-chain. If this is the first BICM in the daisy-chain that the BSM cannot reestablish	Intrusive test performed upon failure of DTC U179C indicated that this is the first BICM in the communication chain with which the BSM cannot regain communication with		System Voltage Active DTCs	> 9.10 V U179C	4.5 seconds	Type B, 2 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 9.10 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 9.10 V	100 ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		communication with, this diagnostic will fail.						

17 OBDG03 BAS3 Hybrid Powertrain Control Processor 2 (HPC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Hybrid Powertrain Control Module	U0293	Detects that CAN serial data communication has been lost with the Hybrid Powertrain Control Module on Bus A	Messages have not been received from the HCP for a specified time	≥ 500ms	Controller On Bus A Communication Enabled Time (Battery Voltage OR Battery Voltage transition from to for time required)	= TRUE >= 5 seconds >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	Runs in 10ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with One or More Hybrid/EV Battery Interface Control Modules	U179C	This diagnostic monitors the UART bus communication status between the battery systems module (BSM) and the battery interface control modules (BICM). The diagnostic monitors BICM data availability whenever the communications bus is active. The communication network between BICMs and BSM is in a daisy-chain architecture, therefore a break at any point in the communication bus results in a loss of BICM communication with the BSM. If any data is received the diagnostic will report a pass. If no data is received for greater than a calibratable amount of time the diagnostic will fail.	Communication unavailable with one or more BICMs		System Voltage	> 9.10 V	4.5 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Hybrid Powertrain Control Module on Bus B	U1817	Detects that CAN serial data communication has been lost with the Hybrid Powertrain Control Module on Bus B	Messages have not been received from the HCP for a specified time	≥ 500ms	Controller On Bus B Communication Enabled Time (Battery Voltage OR Battery Voltage transition from to for time required)	=TRUE >= 5 seconds >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	Runs in 10ms loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With ECM on Bus B	U1818	Detects that CAN serial data communication has been lost with the ECM on Bus B	Messages have not been received from the ECM for a specified time	≥ 500ms	Controller On Bus B Communication Enabled Time (Battery Voltage OR Battery Voltage transition from to for time required)	=TRUE >= 5 seconds >= 9.10 V <= 9.10 V >= 9.60 V >= 5,000 ms	Runs in 10ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Improper Wake-up Performance	U3012	Control Module Wake-up Circuit Performance (Self Wakeup Fault)	Scheduled self wakeup	= did not occur	Diagnostic Enabled	= TRUE	Runs once at powerup if a Self Wakeup request was active last power down	Type B, 2 Trips

Initial Supporting table - C12B1_KtBMCR_K_DeltaPrsScoreWeight

Description:

Notes:

y/x	0.000	250.000	400.000	500.000	800.000	1,100.000	2,200.000	2,400.000	2,600.000	2,800.000	3,000.000
1.000	0.000	0.000	0.600	0.800	0.900	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P057B KtBRKI_K_CmpltTestPointWeight

Description:

Notes:

y/x	0.00	0.04	0.08	0.25	0.35	0.45	0.55	0.75	1.00
1.00	0.00	0.50	0.80	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - P057B KtBRKI_K_FastTestPointWeight

Description:

Notes:

y/x	0.00	0.05	0.08	0.25	0.35	0.45	0.55	0.75	1.00
1.00	0.20	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - Pump Feedback Fault High Threshold

Description: Pump Feedback Fault High Threshold

Notes:

y/x	10	10	30	40	50	60	70	80	90	100
1	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870

Initial Supporting table - Pump Feedback Fault Low Threshold

Description: Pump Feedback Fault Low Threshold

Notes:

y/x	10	10	30	40	50	60	70	80	90	100
1	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870	-1,870

Initial Supporting table - Pump Feedback Repass High Threshold

Description: Pump Feedback Repass High Threshold

Notes:

y/x	10	10	30	40	50	60	70	80	90	100
1	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496

Initial Supporting table - Pump Feedback Repass Low Threshold

Description: Pump Feedback Repass Low Threshold

Notes:

y/x	10	10	30	40	50	60	70	80	90	100
1	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496	-1,496

Initial Supporting table - P171D hydraulic pressure delay

Description: Time to delay the initial x of y counter due to hydraulic transients. Thresholds are a function of transmission fluid temperature. Horizontal axis is transmission fluid temperature (DegC) and table output is delay time (seconds).

Notes: KtCSSD_t_PERF_HydPresDelayTmr

y/x	-40	0	20	30	40	50	60
1	0.100	0.100	0.100	0.100	0.100	0.100	0.100

Initial Supporting table - P171D predicted turbine speed error

Description: Predicted turbine speed vs actual turbine speed error. Thresholds are a function of engine speed and transmission fliud temperature. Diagnostic is considered failing above these values. Table vertical axis is engine speed (RPM), horizontal axis is transmission fluid temperature (DegC) and table output is predicted turbine speed error (RPM).

Notes: KtCSSD_n_PERF_TurbSpdFailThsh

y/x	-40	0	10	20	40
0	350	350	350	350	350
500	350	350	350	350	350
1,100	350	350	350	350	350
1,500	350	350	350	350	350
2,500	350	350	350	350	350

Initial Supporting table - Fan Feedback Fault high Threshold

Description:

Notes:

y/x	10	11	20	30	40	50	60	70	80	90
1	431	431	758	1,039	1,321	1,607	2,032	2,415	2,807	2,918

Initial Supporting table - Fan Feedback Fault low Threshold

Description:

Notes:

y/x	10	11	20	30	40	50	60	70	80	90
1	-1,039	-1,039	-985	-841	-639	-600	-600	-600	-600	-600

Initial Supporting table - Fan Feedback Repass High Threshold

Description:

Notes:

y/x	10	11	20	30	40	50	60	70	80	90
1	345	345	606	831	1,057	1,286	1,626	1,932	2,246	2,334

Initial Supporting table - Fan Feedback Repass Low Threshold

Description:

Notes:

y/x	10	11	20	30	40	50	60	70	80	90
1	-831	-831	-788	-672	-511	-480	-480	-480	-480	-480

Initial Supporting table - KtBSED_P_BPD_C_EndOfLifePwrThrsh

Description:

Notes:

y/x	-30	-20	-10	0	20	30	50
10	0.87	1.81	3.84	6.86	11.00	11.00	11.00
20	0.67	1.42	3.03	5.41	11.00	11.00	11.00
30	0.61	1.29	2.82	5.10	11.00	11.00	11.00
50	0.50	1.09	2.41	4.34	9.49	11.00	11.00
70	0.34	0.76	1.69	3.04	6.63	9.65	10.50
80	0.25	0.55	1.22	2.21	4.83	6.93	7.47
90	0.14	0.31	0.68	1.24	2.74	3.91	4.22

Initial Supporting table - KtBSED_P_BPD_C_MinPassPowerThrsh

Description:

Notes:

y/x	-30	-20	-10	0	20	30	50
10	0.87	1.81	3.84	6.86	11.00	11.00	11.00
20	0.67	1.42	3.03	5.41	11.00	11.00	11.00
30	0.61	1.29	2.82	5.10	11.00	11.00	11.00
50	0.50	1.09	2.41	4.34	9.49	11.00	11.00
70	0.34	0.76	1.69	3.04	6.63	9.65	10.50
80	0.25	0.55	1.22	2.21	4.83	6.93	7.47
90	0.14	0.31	0.68	1.24	2.74	3.91	4.22

Initial Supporting table - KtBSED_P_BPD_D_EndOfLifePwrThrsh

Description:

Notes:

y/x	-30	-20	-10	0	20	30	50
10	-0.75	-1.26	-2.28	-3.74	-6.18	-10.42	-10.50
20	-0.90	-1.59	-2.97	-5.05	-9.09	-10.50	-10.50
30	-0.97	-1.76	-3.35	-5.73	-10.50	-10.50	-10.50
50	-1.08	-2.04	-3.92	-6.66	-10.50	-10.50	-10.50
70	-1.20	-2.30	-4.44	-7.53	-10.50	-10.50	-10.50
80	-1.27	-2.43	-4.70	-7.99	-10.50	-10.50	-10.50
90	-1.32	-2.54	-4.92	-8.40	-10.50	-10.50	-10.50

Initial Supporting table - KtBSED_P_BPD_D_MinPassPowerThrsh

Description:

Notes:

y/x	-30	-20	-10	0	20	30	50
10	-0.75	-1.26	-2.28	-3.74	-6.18	-10.42	-10.50
20	-0.90	-1.59	-2.97	-5.05	-9.09	-10.50	-10.50
30	-0.97	-1.76	-3.35	-5.73	-10.50	-10.50	-10.50
50	-1.08	-2.04	-3.92	-6.66	-10.50	-10.50	-10.50
70	-1.20	-2.30	-4.44	-7.53	-10.50	-10.50	-10.50
80	-1.27	-2.43	-4.70	-7.99	-10.50	-10.50	-10.50
90	-1.32	-2.54	-4.92	-8.40	-10.50	-10.50	-10.50

Initial Supporting table - KtBSED_U_BOV_CellVoltThresh

Description:

Notes:

y/x	-30	-20	-10	0	10	20	30	40	50
1	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50

Initial Supporting table - KtBSED_U_BOV_PackVoltThresh

Description:

Notes:

y/x	-30	-20	-10	0	10	20	30	40	50
1	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00

Initial Supporting table - KtBSED_U_BUV_CellVoltThresh

Description:

Notes:

y/x	-30	-20	-10	0	10	20	30	40	50
1	1.64	1.64	1.64	1.64	1.64	1.80	1.80	1.80	1.80

Initial Supporting table - KtBSED_U_BUV_PackVoltThresh

Description:

Notes:

y/x	-30	-20	-10	0	10	20	30	40	50
1	39.46	39.46	39.46	39.46	39.46	43.15	43.15	43.15	43.15

Bundle Name: Battery Temperature Circuit Erratic

P0A9F, P0AC9, P0ACE, P0AEC, P0BC6, P0C37, P0C80, P0C85, P0C8C, P0C91, P0C96, P0C9B, P0CAC, P0CB1, P0CB6, P0CBB

Battery Temperature Circuit Erratic - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: Battery Temperature Circuit High

P0A9E, P0AC8, P0ACD, P0AEB, P0BC5, P0C36, P0C7F, P0C84, P0C8B, P0C90, P0C95, P0C9A, P0CAB, P0CB0, P0CB5, P0CBA

Battery Temperature Circuit High - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: Battery Temperature Circuit Low

P0A9D, P0AC7, P0ACC, P0AEA, P0BC4, P0C35, P0C7E, P0C83, P0C8A, P0C8F, P0C94, P0C99, P0CAA, P0CAF, P0CB4, P0CB9

Battery Temperature Circuit Low - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: Battery Temperature Performance

P0A9C, P0AC6, P0ACB, P0AE9, P0BC3, P0C34, P0C7D, P0C82, P0C89, P0C8E, P0C93, P0C98, P0CA9, P0CAE, P0CB3, P0CB8

Battery Temperature Performance - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: Cell Voltage Circuit High

P0B3E, P0B43, P0B48, P0B4D, P0B52, P0B57, P0B5C, P0B61, P0B66, P0B6B, P0B70, P0B75, P0B7A, P0B7F, P0B84, P0B89, P0B8E, P0B93, P0B98, P0B9D, P0BA2, P0BA7, P0BAC, P0BB1, P0BB6, P0BBB, P1B18, P1B1B, P1B1E, P1B21, P1B24, P1B27, P1B47, P1B4A, P1B4D, P1B50, P1B53, P1B56, P1B59, P1B5C, P1B5F, P1B62, P1B65, P1B68, P1B6B, P1B6E, P1B71, P1B74, P1B77, P1B7A, P1B7D, P1B80, P1B83, P1B86, P1B89, P1B8C, P1B8F, P1B92, P1B95, P1B98, P1B9B, P1B9E, P1BA1, P1BA4, P1BA7, P1BAA, P1BAD, P1BB0, P1BB3, P1BB6, P1BB9, P1BBC, P1BBF, P1BC2, P1BC5, P1BC8, P1BCB, P1BCE, P1BD1, P1BD4, P1BD7, P1BDA, P1BDD, P1BE0, P1BE3, P1BE6, P1BE9, P1BEC, P1BEF, P1BF2, P1BF5, P1BF8, P1BFB, P1BFE, P1E03, P1E06, P1F76, P1F77, P1F78, P1F79, P1F7A, P1F7B, P1F7C, P1F7D, P1F7E, P1F7F, P1F80, P1F81, P1F82, P1F83, P1F84, P1F85

Cell Voltage Circuit High - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: Cell Voltage Circuit Low

P0B3D, P0B42, P0B47, P0B4C, P0B51, P0B56, P0B5B, P0B60, P0B65, P0B6A, P0B6F, P0B74, P0B79, P0B7E, P0B83, P0B88, P0B8D, P0B92, P0B97, P0B9C, P0BA1, P0BA6, P0BAB, P0BB0, P0BB5, P0BBA, P1B17, P1B1A, P1B1D, P1B20, P1B23, P1B26, P1B46, P1B49, P1B4C, P1B4F, P1B52, P1B55, P1B58, P1B5B, P1B5E, P1B61, P1B64, P1B67, P1B6A, P1B6D, P1B70, P1B73, P1B76, P1B79, P1B7C, P1B7F, P1B82, P1B85, P1B88, P1B8B, P1B8E, P1B91, P1B94, P1B97, P1B9A, P1B9D, P1BA0, P1BA3, P1BA6, P1BA9, P1BAC, P1BAF, P1BB2, P1BB5, P1BB8, P1BBB, P1BBE, P1BC1, P1BC4, P1BC7, P1BCA, P1BCD, P1BD0, P1BD3, P1BD6, P1BD9, P1BDC, P1BDF, P1BE2, P1BE5, P1BE8, P1BEB, P1BEE, P1BF1, P1BF4, P1BF7, P1BFA, P1BFD, P1E02, P1E05, P1F66, P1F67, P1F68, P1F69, P1F6A, P1F6B, P1F6C, P1F6D, P1F6E, P1F6F, P1F70, P1F71, P1F72, P1F73, P1F74, P1F75

Cell Voltage Circuit Low - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: Cell Voltage Circuit Open

P0B3B, P0B40, P0B45, P0B4A, P0B4F, P0B54, P0B59, P0B5E, P0B63, P0B68, P0B6D, P0B72, P0B77, P0B7C, P0B81, P0B86, P0B8B, P0B90, P0B95, P0B9A, P0B9F, P0BA4, P0BA9, P0BAE, P0BB3, P0BB8, P1B28, P1B29, P1B2A, P1B2B, P1B2C, P1B2D, P1E4C, P1E4D, P1E4E, P1E4F, P1E50, P1E51, P1E52, P1E53, P1E54, P1E55, P1E56, P1E57, P1E58, P1E59, P1E5A, P1E5B, P1E5C, P1E5D, P1E5E, P1E5F, P1E60, P1E61, P1E62, P1E63, P1E64, P1E65, P1E66, P1E67, P1E68, P1E69, P1E6A, P1E6B, P1E6C, P1E6D, P1E6E, P1E6F, P1E70, P1E71, P1E72, P1E73, P1E74, P1E75, P1E76, P1E77, P1E78, P1E79, P1E7A, P1E7B, P1E7C, P1E7D, P1E7E, P1E7F, P1E80, P1E81, P1E82, P1E83, P1E84, P1E85, P1E86, P1E87, P1E88, P1E89, P1E8A, P1E8B, P1F86, P1F87, P1F88, P1F89, P1F8A, P1F8B, P1F8C, P1F8D, P1F8E, P1F8F, P1F90, P1F91, P1F92, P1F93, P1F94, P1F95

Cell Voltage Circuit Open - Other Definitions:
GM uses common software amongst its programs. Only DTCs applicable to this program apply to the fault bundle and disable diagnostic monitors

Bundle Name: CrankSensor_FA
P0335, P0336
Bundle Name: Transmission Oil Temperature Validity
P0667, P0668, P0669, P0711, P0712, P0713
Bundle Name: Transmission Output Shaft Angular Velocity Validity
P0722, P0723, P077C, P077D
Bundle Name: Transmission Turbine Angular Velocity Validity
P0716, P0717, P07BF, P07C0