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 B, 2 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 125.00 samples 100 ms /sample	Type B, 2 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	< 3.00 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 B, 2 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 125.00 samples 100 ms /sample	Type B, 2 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	< 3.00 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 (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.	-6.3 Crank Degrees 11.0 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..	-8.3 Crank Degrees 11.6 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.
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.
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	4.3 < ohms < 8.3	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 < 31.9 volts < 0.10 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 Single 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	4.7 < ohms < 8.7	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 < 31.9 volts < 0.10 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.
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	**Engine Off:** If IAT >= OAT: IAT - OAT	> 15.0 deg C	Time between current ignition cycle and the last time the engine was running	>= 28,800.0 seconds	Executed every 100 msec until a pass or fail decision is made	Type B, 2 Trips
			If IAT < OAT: OAT - IAT	> 15.0 deg C	Engine is not running			
					Vehicle Speed	>= 12.4 MPH		
			If either of the following conditions are met, this diagnostic will pass:		Coolant Temperature - IAT	< 15.0 deg C		
					IAT - Coolant Temperature	< 15.0 deg C		
			If IAT >= OAT: IAT - OAT	<= 15.0 deg C	OAT-to-IAT engine off equilibrium counter	>= 300.0 counts		
			If IAT < OAT: OAT - IAT	<= 15.0 deg C	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:	VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_DefaultDetected MAF_SensorFA		

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:	>= 12.4 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	<= 64 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	>= 292,870 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	>= 90 ° 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 > 0.250 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 >= -20.0 degC -20 <= Temp degC <= 125	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 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	**Good Correlation Between IAT and IAT3:** ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT3)	> 25 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
			Not Good Correlation, IAT in middle: 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	
			Not Good Correlation, IAT3 in middle: 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)	> 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 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 enabled 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.
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)	< 34 Ohms	Engine run time OR IAT min	> 10.0 seconds ≤ 70.3 °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)	> 260,000 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.
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.	> 119.0 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 > 30 seconds > 80.0 Deg C	30 failures out of 60 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.
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 < = 1 sec > 8 Volts -100 <= °C <= 132 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) 4 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	>= -20.0 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:	> 15.0 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	<= 180 kPa*(g/s) > 12.0 grams/sec > 15.0 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 <= 5,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 100 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	<= 1,200 Hertz (~ 0.03 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Above criteria present for a period of time	> 1.0 seconds >= 300 RPM >= 8.0 Volts >= 1.0 seconds	200 failures out of 250 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 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 (~ 555.7 gm/sec)	Engine Run Time Engine Speed Ignition Voltage Above criteria present for a period of time	> 1.0 seconds >= 300 RPM >= 8.0 Volts >= 1.0 seconds	200 failures out of 250 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.
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	<= 180 kPa*(g/s) > 15.0 kPa > 15.0 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 <= 5,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 100 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 B, 2 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		
			Engine Not Rotating: 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:	> 15.0 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 B, 2 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 115.0 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.
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)	> 25 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)	> 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 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	< 62.00 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	> 126,840 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)	< 56 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)	> 260,000 Ohms	Engine run time OR IAT min	> 15.0 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.	 7.4 seconds -60.0 Deg C 200.0 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.
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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	> 180 kPa*(g/s) <= 15.0 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 <= 5,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 100 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) = 1 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 35 °C when Ambient min is ≤ 52 °C and > 10 °C. Note: Warm up target for range #1 will be at least 65 °C == == == == Range #2 (Alternate) ECT reaches Commanded temperature minus 45 °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 ≤ 2,200 seconds Ethanol ≤ 87 % ≥ 0.06 miles *************************** 5,000 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 65 °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 ≤ 60 °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 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 0.9912 < ratio < 1.0137 60 < mgram < 500 = Closed Loop = TRUE (Please see "**Closed Loop Enable Clarification**" in Supporting Tables).	285 failures out of 350 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 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 *********************** > 100.0 seconds when engine soak time > 28,800 seconds > 100.0 seconds when engine soak time ≤ 28,800 seconds ≤ 1.014 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.
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	0.3 < Amps < 2.5	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 Single 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	< 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 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	0.991 ≤ ratio ≤ 1.014 60 ≤ 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) 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 Single 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 ≤ 1.014 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 0.20 coefficient. OR Secondary Method: The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds)	> 8.0 units > 70.0 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 20.0 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. < 140.0 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. <u>Primary method</u>: 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 0.20 coefficient. OR Secondary Method: The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds)	> 8.0 units > 200 grams (lower voltage threshold is 350 mvolts and upper voltage threshold is 650 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 20.0 grams/sec. = Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 360,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 20.0 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: 0.950 ≤ Fuel EQR ≤ 1.100			

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 > 70 grams > 0 secs ≥ 5 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 20.0 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	< 140.0 Nm		
					DTC's Passed	P2270		
					Number of fueled cylinders	≤ 3 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 > 200 grams	No Active DTC's	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	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
					B1S2 DTC's Not Active this key cycle	P013A, P013B, P013E, P2270 or P2271		
					System Voltage	> 10.0 Volts		
					Learned heater resistance	= Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's")		
					ICAT MAT Burnoff delay	= Not Valid		
					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: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 20.0 grams/sec.		
					Green Cat System Condition	= Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 360,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 20.0 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: 0.950 ≤ Fuel EQR ≤ 1.100			

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 Single 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	0.3 > amps > 2.5	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 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 0.20 coefficient. OR Secondary Method: The Accumulated time monitored during the R2L Delayed Response Test. AND Pre O2 sensor voltage is	> 0.6 EWMA (sec) ≥ 2.5 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 20.0 grams/sec. ≥ 30 seconds = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") > 60 ºC = TRUE) > -40 ºC > 30 seconds 1,000 ≤ RPM ≤ 3,000 980 ≤ RPM ≤ 3,300 0.8 ≤ gps ≤ 50.0 33.6 ≤ MPH ≤ 77.7 24.9 ≤ MPH ≤ 80.8 0.90 ≤ C/L Int ≤ 1.08		

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	≥ 30.0 sec		
					Predicted Catalyst temp	550 ≤ °C ≤ 900		
					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	≥ 750 mvolts		
					Fuel State	= DFCO active		
					Number of fueled cylinders	≤ 3 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 0.20 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	> 0.9 EWMA (sec) ≥ 2.5 Seconds < 450 mvolts < 750 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. 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 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	= 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 20.0 grams/sec. ≥ 30 seconds = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") > 60 ºC = TRUE) > -40 ºC > 30 seconds 1,000 ≤ RPM ≤ 3,000 980 ≤ RPM ≤ 3,300 0.8 ≤ gps ≤ 50.0 33.6 ≤ MPH ≤ 77.7		

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 :	24.9 ≤ MPH ≤ 80.8 0.90 ≤ C/L Int ≤ 1.08 = 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 ≥ 30.0 sec 550 ≤ ºC ≤ 900 = DFCO inhibit ≥ 1 cylinders ================== ================== 0 ≤ gps ≤ 20 ≤ 5.0 gps		

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)	>= 1.300 >= 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< 5,500 > 70 kPa > -20 °C (or OBD Coolant Enable Criteria = TRUE) < 130 °C 18 <kPa< 255 -20 <°C< 150 1.5 <g/s< 512.0 > 10 % or if fuel sender is faulty the diagnostic will bypass the fuel level criteria. > 44.0 seconds of data must accumulate on each trip, with at least 14.0 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)	<= 0.750 <= 2.000 ************************ <= 0.755 <= 0.750 <= 2.000 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. **************************** <= 100.00 % (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 60 seconds and are separated by the lesser of 20.0 seconds of purge-on time or enough time to purge 36 grams of vapor. A maximum of 3 completed segments or 20 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 > 0.755 , 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 <= 0.755 , 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 <= 0.750 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 > 0.755 for at least 150.0 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) >= 3.00 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 < 0.70 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.
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.
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) > 56.00 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.
Random Misfire Detected Cylinder 1 Misfire Detected Cylinder 2 Misfire Detected Cylinder 3 Misfire Detected Cylinder 4 Misfire Detected	P0300 P0301 P0302 P0303 P0304	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 < 125 ºC < -10 ºC 21 ºC < ECT < 125 ºC 9.00 < volts < 32.00 < 100.00 % per 25 ms < 100.00 % 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 ****************************** Other patterns of misfire use adjustments to the single cylinder continuous misfire threshold tables: RANDOM MISFIRE Use random misfire thresholds If no misfire for (Medres_Decel AND Medres_Jerk) OR (Medres_Decel AND Medres_Jerk) OR (Lores_Decel AND Lores_Jerk)	************************** **This Feature not used on Gasoline engines** **CombustModeIdleTbl** in Supporting Tables ************************** > 3 Engine Cycles > **IdleSCD_Decel** * **Random_SCD_Decel** > **IdleSCD_Jerk** * **Random_SCD_Jerk** > **SCD_Decel** * **Random_SCD_Decel** > **SCD_Jerk** * **Random_SCD_Jerk** > **IdleCyl_Decel** * **RandomCylModDecel** > **IdleCyl_Jerk** * **RandomCylModJerk**			Catalyst Failure reported with (1 or 3) Exceedences in FTP, or (1) Exceedence outside FTP. Continuous	

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)	> **CylModeDecel * RandomCylModDecel** > **CylModeJerk * RandomCylModJerk**				
			OR RevBalanceTime	> **RevMode_Decel * RandomRevModDecl**				
			PAIRED CYLINDER MISFIRE If a cylinder & it's pair are above PAIR thresholds (Medres_Decel AND Medres_Jerk)	> **IdleSCD_Decel * Pair_SCD_Decel** > **IdleSCD_Jerk * Pair_SCD_Jerk**				
			OR (Medres_Decel AND Medres_Jerk)	> **SCD_Decel * Pair_SCD_Decel** > **SCD_Jerk * Pair_SCD_Jerk**				
			OR (Lores_Decel AND Lores_Jerk)	> **IdleCyl_Decel * PairCylModeDecel** > **IdleCyl_Jerk * PairCylModeJerk**				
			OR (Lores_Decel AND Lores_Jerk)	> **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))	> **CylModeDecel * PairCylModeDecel** > 80 engine cycles out of 100 engine cycles				
			BANK MISFIRE Cylinders above Bank Thresholds	>= 3 cylinders				
			(Medres_Decel AND Medres_Jerk)	> **IdleSCD_Decel * Bank_SCD_Decel** > **IdleSCD_Jerk * Bank_SCD_Jerk**				
			OR (Medres_Decel AND Medres_Jerk)	> **SCD_Decel * Bank_SCD_Decel** > **SCD_Jerk * Bank_SCD_Jerk**				
			OR (Lores_Decel AND Lores_Jerk)	> **IdleCyl_Decel * BankCylModeDecel** >**IdleCyl_Jerk * BankCylModeJerk**				
			OR (Lores_Decel AND Lores_Jerk)	> **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** > 3 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	≥ 2.70 % 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 Engine Load Misfire counts	 > 2,000 rpm AND > 25 % load AND < 180 counts on one cylinder		
			When engine speed and load are less than the FTP cals (3) catalyst damage exceedences are allowed.	≤ 1,600 FTP rpm AND ≤ 20 FTP % load				
					Engine Speed	900 < rpm < ((Engine Over Speed Limit) - 200) 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 CamSensorAnyLctnTFTK O AnyCamPhaser_FA AnyCamPhaser_TFTKO AmbPresDfltdStatus	4 cycle delay	
					P0315 & engine speed	> 1,200 rpm	4 cycle delay	
					Fuel Level Low	LowFuelConditionDiagnos tic	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	0 cycle delay	
					Undetectable engine speed and engine load region	***Undetectable region*** from Malfunction Criteria	4 cycle delay	
					Abusive Engine Over Speed	> 7,200 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	≤ 0.0 % (≤ 2.0 % in AFM) > 318 mph (> 158 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** > 4 cylinders	0 cycle delay	
					EGR Intrusive test	if Active	12 cycle delay	
					Manual Trans	Clutch shift	4 cycle delay	
					Accel Pedal Position AND Automatic transmission shift	> 100.00 %	0 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			

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	> 0 % > 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:	Disabled		
					Pattern Recog Enabled during Cylinder Deac	Not Enabled		
					Pattern Recog Enabled consecutive cyl pattrn	Disabled		
					Engine Speed Veh Speed	700 < rpm < 6,100 > 3.1 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 CylAfter_Jerk)	> Misfire_ decel *** 1st_FireAftrMisfr_Acel** > Misfire_Jerk *****		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						1st_FireAftrMisfr_Jerk 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 : NON-CRANKSHAFT BASED ROUGH ROAD: Rough Road Source IF Rough Road Source = WheelSpeedInECM ABS/TCS Wheel speed noise VSES IF Rough Road Source = "FromABS" ABS/TCS RoughRoad VSES IF Rough Road Source = "TOSS" TOSS dispersion AND No Active DTCs	> 1.00 Enabled Wheel Speed in ECM active > **WSSRoughRoadThres** active active detected active >**TOSSRoughRoadThres** in supporting tables Transmission Output Shaft Angular Velocity Validity TransmissionEngagedState_FA (Auto Trans only) ClutchPstnSnsr FA	discard 100 engine cycle test discard 100 engine cycle test discard 100 engine cycle test discard 100 engine cycle test 4 cycle delay	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						(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 ≥ 700 RPM AND ≤ 8,500 RPM ≥ 700 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C ≥ 174 revs	First Order Lag Filters with Weight Coefficient = 0.0220 Updated each engine event	Type B, 2 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** **<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 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 ≥ 700 RPM and ≤ 8,500 RPM ≥ 100 revs ≥ 40 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 B, 2 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 ≥ 2,800 RPM (not in AFM mode) OR ≥ 2,000 (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) ≥ 50 Revs	First Order Lag Filters with Weight Coefficient = 0.0100 Updated each engine event	Type B, 2 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 B, 2 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 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) 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 > 2.0 grams/second))	Continuous every 100 msec	Type B, 2 Trips
			No crankshaft pulses received	>= 0.3 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 8 or more crank re-synchronizations occur	< 4.0 seconds	Engine Air Flow Cam-based engine speed No DTC Active:	>= 2.0 grams/second > 100 RPM P0335	Continuous every 250 msec	Type B, 2 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 > 2.0 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 > 2.0 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.
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.	$\geq$ 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 #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.
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 > 2.0 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.
Exhaust Gas Recirculation (EGR) Flow Insufficient	P0401	During a closed throttle decel condition, the EGR valve is normally closed. This diagnostic opens the valve to a pre-determined position, and the change in MAP is computed. This change in MAP correlates to the flow rate of the EGR system.	With EGR valve open, the peak positive MAP change is monitored over a period of time. This value is compared with a threshold from an Engine Speed vs Baro table and the difference computed. The result is statistically filtered (EWMA) and compared to a decision limit.	DTC is set when the filtered pressure change (NeEGRD_p_EWMA) exceeds 2.40 kPa.	EGR is available.	True	Time to test (once enabled) = 0.50 sec. Completes once per trip (typically) 6.25 ms operating loop	Type A, 1 Trips
					DTC's NOT active	FuelInjectorCircuit_FA CrankSensor_FA TPS_Performance_FA TPS_FAMAP_SensorFA VehicleSpeedSensor_FA 5VoltReferenceA_FA 5VoltReferenceB_FA IAT_SensorFA ECT_Sensor_Ckt_FA IAC_SystemRPM_FA EGRValveCircuit_FA EngineMisfireDetected_FA MAF_SensorFA, , Ethanol Composition Sensor FA P0604		
					No engine over heat	EngineMetalOvertempActive		
					Power Take off mode	Not active		
					Traction control	Not active		
					Device Control	Not active		
					Catalyst Protection mode	Not active		
					Difference between desired & actual Air Charge	< 15.00 kPa		
					Barometric Pressure	> 70.00 kPa & NOT defaulted		
					Intake Air Temperature	-5.00 ~ 100.00 degC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Trans gear stable timer	> 1.00 sec		
					Decel fuel cut off state is unchanged for time	> 0.45 sec		
					Vehicle Speed	12.00 ~ 511.99 mph		
					Arbitrated Torque	< 50.0		
					EGR Position	< 5.50		
					Engine Speed	1,030.00 ~ 1,300.00 rpm		
					MAP change	< 1.00 Kpa		
					Altitude-compensated MAP	20.00 ~ 50.00 kPa		
					[STEP CHANGE DETECTION]			
					IF {}{ the difference between the current EWMA and the current map diff >	> **P0401_StepDelta** kPa		
					AND			
					Current map diff }	> **P0401_StepMAP_DIFF** kPa		
					Run multiple tests	**P0401_StepSamplesPerTrip**		
					until			
					number of tests have been completed.	**P0401_SamplesAfterStep**		
					[Intrusive Mode			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Enablements]			
					Pos. Delta RPM	<= 100.00 rpm		
					Neg. Delta RPM	<= 100.00 rpm		
					Number of EGR On-time execution loops	< 40.00 times		
					Throttle Area fluctuations	< = 1.20 %		
					[CODE CLEAR / NONVOLITLE MEMORY RESET DETECTION:]			
					Upon code clear or a nonvolatile memory failure, Initiate multiple tests. Run multiple tests per trip until	**P0401_SamplesAfterReset** # of tests have been completed.		
					.			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Solenoid Circuit Open	P0403	Controller specific output driver circuit diagnoses the EGR 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.	≥ 4 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	9.00 failures out of 11.00 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.
EGR Valve - Open Position Performance	P0404	Diagnostic enables while EGR valve is commanded open and opening position remains stable within time limit. This diagnostic detects if the error between actual and desired is too large.	When EGR is commanded to open, check difference between actual and commanded position of the valve. If this error is more than error threshold than open position performance failure is set.	> 5.00 %	The following DTC's NOT active:	P0405 P0406	2.00 failures out of 20.00 samples 100ms loop Continuous	Type B, 2 Trips
					Engine is running	Active		
					Off-board device	Not Active		
					PTO	Not Active		
					P0401 Intrusive	Not Active		
					Ignition voltage	>= 11.00 Volt		
					EGR control	Enabled		
					Desired EGR position variation	< 3.00 for 2.00 sec.		
					Enable conditions met	3.00 sec		
					Desired EGR position	> 0%		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Valve - Position Sensor - Circuit Low	P0405	This diagnostic detects if the valve position feedback circuit is open or shorted to ground by comparing the sensor feedback to normal operating ranges	Raw EGR feedback sensor signal is less than the expected low limit If below allowed operating range, test fails.	Raw EGR feedback sensor signal < 5.00 %	The following DTC's NOT active:		25.00 failures out of 31.00 samples 100 ms Continuous	Type B, 2 Trips
					Engine Run State	Active		
					Off-board device	Not active		
					PTO	Not active		
					EGR Flow Insufficient (P0401)	Not intrusive		
					Ignition voltage	>= 11.00		
					EGR diagnostic	Enabled		
					Enable conditions met for	3.00 sec.		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Valve - Position Sensor - Circuit High	P0406	This diagnostic detects if the valve position feedback circuit is shorted to high voltage or the 5V return is open.	Raw EGR feedback sensor signal is greater than the expected high limit. By comparing the feedback value to the max allowed operating range.	Raw EGR feedback sensor signal > 95.00 %	The following DTC's NOT active: Engine Run State Off-board device PTO EGR Flow Insufficient (P0401) Ignition voltage EGR diagnostic Enable conditions met for	 Active Not active Not active Not intrusive >= 11.00 Enabled 3.00 sec.	25.00 failures out of 31.00 samples 100 ms Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Temperature Sensor2 Ckt Range/ Performance	P040B	Determines the EGR temperature Sensor 2 has not moved enough since start after an allowed amount of EGR flow consumed by engine following a long enough soak.	After an allowed amount of EGR flow consumed by engine following a long enough soak, the Down Stream Temperature sensor has not change enough.	Absolute error between current temperature and Initial temperature <= **Down Stream Stk Temp Vrtn**	System supply voltage Engine soak (not run) time No Active DTCs Engine is running	> 11.00 Volts >= 28,800.00 Sec P262B Active	Cumulative EGR Flow > 2,000.00 100 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.
EGR Temperature Sensor2 Ckt Low	P040C	Diagnose the EGR Down Stream Temperature sensor circuit low if the feedback of the Down Stream temp sensor is below allowed operating range the sensor is faulted.	The ECM detects that the measured resistance of the temperature sensor is out of range low.	Measured Resistance of the Temperature sensor < 40.00 Ω impedance	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	40 failures out of 50 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.
EGR Temperature Sensor2 Ckt High	P040D	Diagnose the EGR Down Stream Temperature sensor circuit high if the feedback of the Down Stream temp sensor is above allowed operating range the sensor is faulted	The ECM detects that the measured resistance of the temperature sensor is out of range high.	Measured Resistance of the Temperature sensor > 2,000.00 Ω impedance	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	40 failures out of 50 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.
EGR Temperature Sensor2 Ckt Intermittent/ Erratic	P040E	Detects a temperature sensor that is showing erratic or intermittent temperature readings. The temperature feedback is monitored in a 100 ms time loop. If the temperature is changing more than an allowed amount per loop the sensor is determined to be erratic.	The absolute value of the loop to loop (100 ms / sample) resistance change of the temperature sensor is greater than the allowed rate of change.	Delta change > 10.00 Ω impedance	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	40 failures out of 50 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.
EGR Temperature Sensor1 Ckt Range/ Performance	P041B	Determines the EGR temperature Sensor 1 has not moved enough since start after an allowed amount of EGR flow consumed by engine following a long enough soak.	After an allowed amount of EGR flow consumed by engine following a long enough soak, the Up Stream Temperature sensor has not change enough.	Absolute error between current temperature and Initial temperature <= **UP Stream Stk Temp Vrtn**	System supply voltage Engine soak (not run) time No Active DTCs Engine is running	> 11.00 Volts >= 28,800.00 Sec P262B Active	cumulative EGR Flow > 300.00 100 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.
EGR Temperature Sensor1 Ckt Low	P041C	Diagnose the EGR Up Stream Temperature sensor circuit low by measuring the resistance of the sensor circuit. If the measured resistance of the circuit is below the allowed operating range, the sensor is out of range low.	The ECM detects that the measured resistance of the temperature sensor is out of range low.	Measured Resistance of the Temperature sensor < 40.00 Ω impedance	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	40 failures out of 50 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.
EGR Temperature Sensor1 Ckt High	P041D	Diagnose the EGR Up Stream Temperature sensor circuit high by measuring the resistance of the sensor circuit. If the measured resistance of the circuit is above the allowed operating range, the sensor is out of range high.	The ECM detects that the measured resistance of the temperature sensor is out of range high.	Measured Resistance of the Temperature sensor > 2,000.00 Ω impedance	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	40 failures out of 50 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.
EGR Temperature Sensor1 Ckt Intermittent/ Erratic	P041E	Detects a temperature sensor that is showing erratic or intermittent temperature readings. The temperature feedback is monitored in a 100 ms time loop. If the temperature is changing more than an allowed amount per loop the sensor is determined to be erratic.	The absolute value of the loop to loop (100 ms / sample) resistance change of the temperature sensor is greater than the allowed rate of change.	Delta chage > 10.00 Ω impedance	System supply voltage Output driver Ignition switch	> 11.00 Volts On Crank or Run	40 failures out of 50 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.
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)	< 0.20	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	> 0.60 < 0.10 12 > 0.80 g/s < 5.00 g/s < 900 ° C > 750.00 mV or > 1.20 EQR > 750.00 mV	1 test attempted per valid decel 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.
		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.
EGR Valve - Closed-Valve Position Performance	P042E	This diagnostic detects if the valve is stuck open when commanded closed. The actual feedback position of the EGR valve is monitored when the valve is commanded closed. If the actual feedback reading is reporting a position greater than the closed position reading the valve is determined to be stuck open."	Actual valve position is greater than an error threshold (% of reference voltage from learned closed position)	Raw EGR feedback sensor signal > 5.00	The following DTC's NOT active: Engine is running Off-board device PTO P0401 Intrusive Ignition voltage EGR diagnostic Desired EGR position Enable conditions	P0405 P0406 Not Active Not Active Not Active Not Active >= 11.00 Volt Enabled = 0, for at least 2.00 sec Met for 3.00 sec	2.00 failures out of 20.00 100 ms Continuous	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 System Leak Detection Reference Orifice Low Flow (ELCP Vented Fuel System)	P043E	A plugged ELCP reference orifice is detected. When the ELCP vacuum pump is on, the ELCP pressure sensor (gauge) measures the vacuum across the reference orifice. The reference vacuum is established when the test time expires. If the reference vacuum is above a maximum reference vacuum threshold then this would indicate a plugged reference orifice. 1st Reference Vacuum Measurement If the 1st reference vacuum measurement is above a maximum threshold then a failure is reported for P043E. This condition could indicate a plugged reference orifice or high flow ELCP vacuum pump. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete. In a passing condition,	If 1st 0.020" reference orifice vacuum averaged measurement is after then a plugged ELCP reference orifice is detected and the DTC fails. Or If 2nd 0.020" reference orifice vacuum averaged measurement is after then a plugged ELCP reference orifice is detected and the DTC fails.	3 second ≥ refer to **P043E First Reference Orifice Measurement** in Supporting Tables 360 seconds 3 second ≥ refer to **P043E Second Reference Orifice Measurement** in Supporting Tables 30 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ***************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ***************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds Or	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ***************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to twice per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the P043E will not report a pass at this time since this diagnostic is run again during the 2nd reference orifice check section. 2nd Reference Vacuum Measurement If the 2nd reference vacuum measurement is above a maximum threshold then a failure is reported for P043E. This condition could indicate a plugged reference orifice or high flow ELCP vacuum pump. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete. In a passing condition, the P043E will report a pass at this time.			Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling) No Active DTC's No Active DTC's TFTKO	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA P043F P0451 P145C P145D P1462 P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Leak Detection Reference Orifice High Flow (ELCP Vented Fuel System)	P043F	A missing ELCP reference orifice is detected. When the ELCP vacuum pump is on, the ELCP pressure sensor (gauge) measures the vacuum across the reference orifice. The reference vacuum is established when the test time expires. If the reference vacuum is below a minimum reference vacuum threshold then this would indicate a missing reference orifice. 1st Reference Vacuum Measurement If the 1st reference vacuum measurement is below a minimum threshold then a failure is reported for P043F. This condition could indicate a missing reference orifice or low flow ELCP vacuum pump. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete. In a passing condition, P043F will not report a pass at this	If 1st 0.020” reference orifice vacuum averaged measurement is after then a missing ELCP reference orifice is detected and the DTC fails. Or If 2nd 0.020” reference orifice vacuum averaged measurement is after then a missing ELCP reference orifice is detected and the DTC fails.	3 second ≤ refer to **P043F First Reference Orifice Measurements** in Supporting Tables 360 seconds 3 second ≤ refer to **P043F Second Reference Orifice Measurements** in Supporting Tables 30 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ***************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ***************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds Or	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ***************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to twice per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		time since this diagnostic is run again during the 2nd reference orifice check section. 2nd Reference Vacuum Measurement If the 2nd reference vacuum measurement is below a minimum threshold then a failure is reported for P043F. This condition could indicate a missing reference orifice or low flow ELCP vacuum pump. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete. In a passing condition, P043F will report a pass at this time.			Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling) No Active DTC's No Active DTC's TFTKO	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA P043E P0451 P145C P145D P1462 P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP System Small Leak Detected (ELCP Vented Fuel System)	P0442	A small leak (≥ 0.020") is detected in the EVAP system between the fuel cap and purge solenoid. The ELCP vacuum pump creates a vacuum across a 0.020" reference orifice. This reference vacuum is then compared to the vacuum level created in the fuel tank to determine if a leak exists.	If the ELCP pressure sensor (gauge) vacuum reading is less than the 2nd 0.020" reference orifice vacuum measurement for then the fuel tank system has a small leak and the DTC fails.	1,000 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ***************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ***************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds Or	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ***************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Once per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm) Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P0451 P145C P145D P145F P1462 P1463 P2450 P24B9		

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 Open Circuit (ELCP Sealed/ Vented Fuel System)	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 Diagnostic (ELCP Vented Fuel System)	P0446	EVAP vent system restriction is detected. The vent restriction diagnostic (P0446) is intrusive and runs as part of the purge valve low flow (P0497) diagnostic and the active FTP sensor correlation diagnostic. It is a X out of Y diagnostic that runs once per trip. The same hysteresis calibrations that define the operating range for the P0497 diagnostic are also used for the vent restriction diagnostic. When the P0497 diagnostic is running, purge priority is requested along with an engine vacuum request. The purge priority and vacuum request are maintained until the P0497, P0446, P1464 diagnostics are complete, or until a maximum engine vacuum request time is reached. The P0446 diagnostic will not begin until the P0497 and P1464 diagnostics are in a passing	After an initial time delay of if the Fuel Tank Pressure (FTP) sensor indicates a vacuum level is then the fail counter is incremented.	3 seconds, < -3,238 Pa	Min baro Max baro Min OAT Max OAT ***************************** Conditions for corrected / estimated ambient temperature using OAT sensor to be valid = TRUE ***************************** Vehicle speed Engine RPM to enable Engine RPM to re-enable Engine vac to enable Engine vac to re-enable Engine airflow to enable Engine airflow to re-enable Fuel level Purge flow to enable Purge flow to re-enable Purge DC to enable Purge DC to re-enable Requested purge flow to enable Delivered purge flow to re-enable Delivered purge flow to enable Engine Running Run/Crank Voltage Purge is enabled Abort Conditions: Device control exceeds Passing DTC's	≥ 70 Pa ≤ 110 kPa ≥ 4 °C ≤ 35 °C ***************************** ***************************** ≥ 31 MPH 1,140 ≤ RPM ≤ 4,100 1,160 ≤ RPM ≤ 4,000 8 kPa ≤ vac ≤ 41 kPa 9 kPa ≤ vac ≤ 40 kPa 9 gps ≤ airflow ≤ 45 gps 9 gps ≤ airflow ≤ 44 gps ≤ 90 % ≥ 0.26 gps ≥ 0.27 gps ≥ 25.0 % ≥ 27.0 % ≥ 3.00 % ≥ 2.85 % ≥ 2.80 % ≥ 11.0 volts 0.5 seconds P0497 P1464	50 failures out of 63 samples Once per trip when Propulsion System Active and Engine On 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		condition. If the P0497 or P1464 diagnostics detect a failure, then the P0446 diagnostic will not execute. If a passing condition is reached for both the P0497 and P14694 diagnostics there is then a short time delay before starting the P0446 diagnostic. This allows the ELCP switching valve to transition back to the vent position and the vacuum in the fuel tank to return to normal operating levels. After this time delay the FTP sensor is monitored and compared to an upper vacuum threshold and the sample counter begins to increment. If the vacuum in the fuel tank exceeds the threshold then the fail counter increments. If the fail counter reaches its threshold then a fail is reported for P0446. A pass is reported for P0446 if the sample counter reaches its threshold. The diagnostic concludes when either the fail or sample counters reach			No Active DTC's No Active DTC's TFTKO	MAP_SensorFA EnginePowerLimited AmbientAirDefault OAT_EstAmbTemp_FA VehicleSpeedSensor_FA FuelLevelDataFault P0442 P0443 P0451 P0452 P0453 P0455 P0458 P0459 P0497 P145D P1463 P1464 P2400 P2401 P2402 P2418 P2419 P2420 P2450 P24B9 P24BA P24BB		

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

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 Diagnostic (ELCP Vented Fuel System)	P0451	Fuel Tank Pressure (FTP) sensor correlation diagnostic with propulsion system not active. Propulsion System Off The FTP sensor correlation diagnostic is performed during the EVAP leak check section which allows the sensor to be checked over a wider operating range. For the FTP sensor to ELCP pressure sensor correlation, the ELCP vacuum pump is on and the ELCP switching valve is in the pump position. When the ELCP vacuum pump is creating a vacuum in the fuel tank, the FTP sensor and ELCP pressure sensor readings are compared. The FTP sensor correlation check uses an average difference comparison between the FTP sensor and ELCP pressure sensor readings. This logic is also used when the FTP sensor is beyond its range but the ELCP	This diagnostic runs when the ELCP vacuum pump is creating a vacuum on the fuel tank during the ELCP leak detection test sequence. After a delay time of IF 1) the FTP sensor reading is and (the FTP sensor is in a readable range) or 2) the ELCP pressure sensor (gauge) reading is and (the ELCP pressure sensor indicates that the FTP sensor is in a readable range) THEN if the average difference between the FTP sensor reading and ELCP pressure sensor (gauge) reading is over a time period then a FTP sensor correlation failure has been detected and the DTC fails. The period of time is from to	5 seconds, > -3,911 Pa < 1,420 Pa > -3,687 Pa < 1,196 Pa > 1,021 Pa ≥ 5 seconds 1) ≤ 2,500 seconds, or 2) the time when both the FTP and ELCP	Propulsion System Not Active Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT MaxIAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ****************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds	Once per trip with Propulsion System Not Active, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure sensor indicates it should be in a readable range. The difference between the two sensor readings is averaged over a time period and then compared to a fail threshold. If the average difference is above the threshold, a fail is reported for P0451. The ELCP EVAP diagnostic test sequence is complete if a failure is detected. In the case where the vacuum level in the fuel tank is beyond the FTP sensor range and the ELCP pressure sensor indicates the same, then P0451 concludes and pass/fail results are based on the average difference results before both sensors indicated the FTP sensor was beyond its readable range.		sensors indicate that the FTP sensor is outside its readable range, or 3) the time when the EVAP leak check section ends.	Or Device control exceeds Or Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm) Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)	 0.5 seconds		
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P145C P145D P1462 P1463 P2450 P24B9		

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 (ELCP Sealed/ Vented Fuel System)	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 (~ -3757 Pa) to 4.5 volts (~ 3329 Pa).	< 0.15 volts (3.0 % of Vref or ~ -4,111 Pa)			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 (ELCP Sealed/ Vented Fuel System)	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 (~ -3757 Pa) to 4.5 volts (~ 3329 Pa).	> 4.85 volts (97.0 % of Vref or ~ 3,684 Pa)			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 (ELCP Vented Fuel System)	P0454	This DTC will detect intermittent tank vacuum sensor signals that would have caused the ELCP small leak test to abort due to an apparent re-fueling event. Since the ELCP EVAP diagnostic test sequence with propulsion system off starts many hours after the engine has been turned off, the potential for the diagnostic to encounter a refueling event during the test sequence is remote but still possible (e.g. adding fuel from a gas can or trailering/towing vehicle to gas station). When the test sequence is running, the fuel level and fuel tank pressure/vacuum are continuously monitored for refueling detection. An apparent refueling event can be detected either by a change in fuel level, a sudden vacuum change, or a high level of pressure in the fuel tank. A vacuum refueling detection can only occur when the ELCP switch valve is in	If an abrupt change in fuel tank vacuum is detected, the ELCP leak detection test sequence 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 event is confirmed, then the test sample is considered passing. Otherwise, if a refueling event is not confirmed, then the test sample is considered failing which indicates an intermittent signal problem. An abrupt change in fuel tank vacuum is defined as: Tank vacuum changes by in the span of 1.0 second. But in 12.5 msec. An intermittent fuel tank pressure sensor signal problem is defined as: An abrupt change in fuel tank vacuum is detected but a refueing event is not confirmed since the fuel level does not remain	> 112 Pa < 249 Pa > 15 %	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds Or	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ****************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	This test is executed during ELCP leak detection test sequence. The test can only execute up to once per propulsion system 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 B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the pump position. The FTP sensor is used for the pressure/vacuum refueling detection. If an apparent refueling event is detected, the diagnostic will abort from its current state and transition to the refueling rationality check section. The refueling rationality section will determine if the apparent refueling event was rational or irrational. Refueling Rationality Test After a refueling event was detected, the refueling rationality test looks for a persistent change in fuel level to occur for a specified period of time. The calibrations for the amount of time that the change must persist and how long to wait for the persistent change after the detection are common calibrations. In addition, the diagnostic uses an X-out-of-Y scheme. Thus, when a given test completes, the	for 30 seconds during a 600 second refueling rationality test.		Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P0451 P145C P145D P1462 P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		sample counter is incremented. The sample counter will be reset to one the first time a failure is detected. This allows the MIL to be illuminated properly regardless of the initial value of Y when the first failure occurs. If the test fails, then a fail counter is incremented. There are two pairs of counters: 1) One sample/fail counter pair for the vacuum refueling detection 2) One sample/fail counter pair for the fuel level refueling detection. A failure occurs when an apparent refueling event was detected either by a change in fuel level, a sudden vacuum change, or a high level of pressure in the fuel tank, but a persistent change in fuel level does not occur for a specified period of time.						

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 (ELCP Sealed/ Vented Fuel System)	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 (ELCP Sealed/ Vented Fuel System)	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 a single fuel tank)	P0461	This DTC will detect a fuel sender stuck in range in the primary fuel tank.	Delta fuel volume change over 19.3 liters of fuel consumed by the engine.	< 3 liters	Engine Running No active DTCs:	 VehicleSpeedSensor_FA	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 50.00 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 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 1.50 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 (ELCP Vented Fuel System)	P0464	This DTC will detect intermittent fuel level sensor signals that would have caused the ELCP small leak test to abort due to an apparent re-fueling event. Refueling Detection Since the ELCP EVAP diagnostic test sequence with propulsion system off starts many hours after the engine has been turned off, the potential for the diagnostic to encounter a refueling event during the test sequence is remote but still possible (e.g. adding fuel from a gas can or trailering/towing vehicle to gas station). When the test sequence is running, the fuel level and fuel tank pressure/vacuum are continuously monitored for refueling detection. An apparent refueling event can be detected either by a change in fuel level, a sudden vacuum change, or a high level of pressure in the fuel tank. A vacuum refueling detection can	If a change in fuel level is detected, the ELCP leak detection test sequence 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.	 > 15 % > 15 %	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds Or	 4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ****************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	This test is executed during the ELCP leak detection test sequence. 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 B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		only occur when the ELCP switch valve is in the pump position. The FTP sensor is used for the pressure/vacuum refueling detection. If an apparent refueling event is detected, the diagnostic will abort from its current state and transition to the refueling rationality check section. The refueling rationality section will determine if the apparent refueling event was rational or irrational. Refueling Rationality Test After a refueling event was detected, the refueling rationality test looks for a persistent change in fuel level to occur for a specified period of time. The calibrations for the amount of time that the change must persist and how long to wait for the persistent change after the detection are common calibrations. In addition, the diagnostic uses an X-out-of-Y scheme.			Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P0451 P145C P145D P145F P1462 P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Thus, when a given test completes, the sample counter is incremented. The sample counter will be reset to one the first time a failure is detected. This allows the MIL to be illuminated properly regardless of the initial value of Y when the first failure occurs. If the test fails, then a fail counter is incremented. There are two pairs of counters: 1) One sample/fail counter pair for the vacuum refueling detection 2) One sample/fail counter pair for the fuel level refueling detection. A failure occurs when an apparent refueling event was detected either by a change in fuel level, a sudden vacuum change, or a high level of pressure in the fuel tank, but a persistent change in fuel level does not occur for a specified period of time.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Solenoid Circuit Low	P0489	This DTC checks the EGR circuit for electrical shorts to ground.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match by monitoring the PWM voltage sent to the EGR Valve. If the PWM voltage is pulled down below an allowed operating threshold the circuit is determined to be shorted to ground : LSO	< 0.15 volts (3.0 % of Vref (5V)	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	9.00 failures out of 11.00 samples250 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.
EGR Solenoid Circuit High	P0490	This DTC checks the EGR circuit for electrical shorts to high voltage.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match by monitoring the PWM voltage sent to the EGR Valve. If the PWM voltage is pulled up above an allowed operating threshold the circuit is determined to be shorted to power : LSO	> 4.85 volts (97.0% of Vref (5 V)	System supply voltage Output driver is commanded on Ignition switch is in crank or run position	> 11.00 Volts	9.00 failures out of 11.00 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.
Evaporative Emission System Low Purge Flow Diagnostic (ELCP Vented Fuel System)	P0497	Low purge flow is detected. This diagnostic is executed once per trip when the engine is running and purge enabled. Various parameters are monitored and compared to hysteresis thresholds so that the diagnostic can be run in a reliable purge flow region. In certain conditions, the purge low flow diagnostic has the ability to extinguish the MIL after only 1 pass. This is allowed under the following conditions, the first failure occurs after a refueling event and the MIL was not already on for P0497. This is the likely scenario where the customer left the fuel cap off after the refuel event, failed the purge low flow diagnostic, and later put the fuel cap back on. Note: The MIL not on condition is based on agreements with CARB. If the MIL was	After an ELCP switching valve delay time of if the ELCP pressure sensor (gauge) indicates a vacuum change for then a low purge flow failure has been detected and the DTC fails.	0.2 seconds, < 525 Pa 11 seconds	Min baro Max baro Min OAT Max OAT ****************************** Conditions for corrected / estimated ambient temperature using OAT sensor to be valid = TRUE ****************************** Vehicle speed Engine RPM to enable Engine RPM to re-enable Engine vac to enable Engine vac to re-enable Engine airflow to enable Engine airflow to re-enable Fuel level Purge flow to enable Purge flow to re-enable Purge DC to enable Purge DC to re-enable Requested purge flow to enable Delivered purge flow to re-enable Delivered purge flow to enable Engine Running Run/Crank Voltage Purge is enabled Abort Conditions: Device control exceeds No Active DTC's	≥ 70 kPa ≤ 110 kPa ≥ 4 °C ≤ 35 °C ****************************** ****************************** ≥ 31 MPH 1,140 ≤ RPM ≤ 4,100 1,160 ≤ RPM ≤ 4,000 8 kPa ≤ vac ≤ 41 kPa 9 kPa ≤ vac ≤ 40 kPa 9 gps ≤ airflow ≤ 45 gps 9 gps ≤ airflow ≤ 44 gps ≤ 90 % ≥ 0.26 gps ≥ 0.27 gps ≥ 25.0 % ≥ 27.0 % ≥ 3.00 % ≥ 2.85 % ≥ 2.80 % ≥ 11.0 volts 0.5 seconds MAP_SensorFA	Once per trip with Propulsion System Active and Engine On 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		turned on not due to a refueling event, then the 3 pass MIL off rule needs to be maintained until the MIL is extinguished. If the first failure did not occur after a refueling event or the MIL was already on for P0497, then 3 passes are needed to extinguish the MIL. Using the 1 or 3 pass MIL off is a calibration option. On capless fuel systems, 3 passes are always needed to extinguish the MIL. The diagnostic is enabled when the thresholds for requested purge flow, engine RPM, engine airflow, and engine vacuum are met. When these conditions are satisfied then purge priority along with a maximum purge duty cycle value is requested. Once purge priority is granted, an engine vacuum request is made if the optional engine vacuum request is used. When the engine vacuum request is used the ECM communicates with the			 No Active DTC's TFTKO	EnginePowerLimited AmbientAirDefault OAT_EstAmbTemp_FA VehicleSpeedSensor_FA FuelLevelDataFault P0442 P0443 P0455 P0458 P0459 P145D P1463 P2400 P2401 P2402 P2418 P2419 P2420 P2450 P24B9 P24BA P24BB		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		hybrid controller which allows the engine to operate in a condition that produces the minimum desired vacuum level. Once the vacuum request is made, various parameters which include delivered purge flow, engine RPM, engine airflow, engine vacuum, unfiltered purge flow, and purge duty cycle are monitored for proper purge flow and operating conditions. If those conditions are lost for a period of time greater than a threshold then purge priority is released. Purge priority will not be requested again until a period of time greater than a threshold has elapsed. This allows other diagnostics the opportunity to run. The engine vacuum request is also limited to a maximum time per trip. It is a cumulative timer and once the threshold is reached the request will be cancelled and not requested again for the remainder of the						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		trip. This maximum time also limits how long the diagnostic will run when the engine vacuum request option is not used. There is a calibratable option that prevents autostop and DFCO from occurring above a vehicle speed once all the flow conditions are met. If the vehicle speed drops below this calibration then autostop and DFCO are allowed. Using this option may provide more opportunity to complete the diagnostic quicker. When the flow conditions are met the ELCP switching valve is moved to the pump position allowing the ELCP pressure sensor to have communication with the fuel tank. A short time later a reading from the ELCP pressure sensor is taken which represents the initial pressure value. The ELCP pressure sensor is then continuously monitored and compared to the						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		initial pressure value. If the difference is greater than a threshold calibration then purge flow is considered to be present. The ELCP switching valve will remain in the pump position until the FTP sensor correlation diagnostic is in a passing condition or is complete. A pass for P0497 is not reported at this time; the engine vacuum request remains active and the operating conditions are monitored until the test timer reaches the fail time threshold calibration. Once the fail time threshold is reached a pass is reported for P0497. If the vacuum difference was not achieved within the fail time then a fail is reported for P0497 indicating no purge flow present. The purge priority and engine vacuum request are released once the purge low flow diagnostic, vent restriction diagnostic, and the FTP sensor correlation diagnostic						

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

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 < 300.00 degC > -10.00 degC <= 40.00 degC >= 70.00 KPa >= 450.00 RPM <= 2,200.00 RPM <= 60.00 Pct < 60 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	>= 700.00 degC >= 25.00 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	< 70.00 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	> 3,000.00 RPM		
					Accel Position	> 100.00 Pct		
					Engine Run Time	>= 60 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	Not Active		
					General Enable			
					DTC's Not Set:	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.
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 + 139.0 kPa) Filtered Oil Pressure > (10.0 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 > 5,000 RPM for longer than 60.0 seconds) Filtered Engine Speed within range Modelled Oil Temperature within range No active DTC's	TRUE Enabled Test not report a fail state Yes ≥ 5.0 seconds ≥ 70.0 kPa FALSE 1,100 RPM ≤ Filtered Engine Speed ≤ 4,500 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 + 139.0 kPa) - 10.0 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 ≥ 40.0 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.
Air Conditioning High Side Pressure Sensor (HSPS) Circuit Low Voltage	P0532	Determines if the Air Conditioning High Side Pressure Sensor circuit voltage is too low	(AC High Side Pressure Sensor Circuit Voltage) ÷ 5 Volts) *100	< 2 percent	AC HSP Sensor Present Diagnostic Status	Yes Enabled	80 failures out of 100 samples Performed every 25 msec	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Air Conditioning High Side Pressure Sensor (HSPS) Circuit High Voltage	P0533	Determines if the Air Conditioning High Side Pressure Sensor circuit voltage is too high	(AC High Side Pressure Sensor Circuit Voltage) ÷ 5 Volts) *100	> 92 percent	AC HSP Sensor Present Diagnostic Status	Yes Enabled	80 failures out of 100 samples Performed every 25 msec	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Voltage Performance	P0561	Detects a low performing 12V battery system. This diagnostic reports the DTC when the absolute value of the difference between the battery voltage and the run/ crank voltage exceeds a calibrated value.	Run Crank voltage low and high	ABS(Battery voltage - Run Crank voltage) > 3.00	Battery voltage B+ line present = TRUE Battery voltage low and high diag enable = TRUE Run Crank voltage	1.00 1.00 Voltage ≥ 5.00 volts	50 failures out of 63 samples 100 ms / sample	Type C, No SVS

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 SVS , 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 SVS , 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 SVS , 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 SVS , 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 SVS , 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 SVS , 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 > 4.00 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	25.00	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 SVS , 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 SVS , special type C

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.	≥ 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	5 failures out of 6 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 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 Run Crank active == Above is true and == Last Ground Short Circuit Test	= True = True = True ================ = not Indeterminate	5 failures out of 6 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.	≤ 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	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.
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 > 129.00 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.
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 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 2 Position Response AND Shutter 2 Diagnostic Delay Threshold count	<> Smart Shutter Actuator 2 Commanded Position percent AND Counter > 129.00 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.
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 > 5.00 deg.	**Intake Cam Phsr Enable** System Voltage Engine Running Power Take Off (PTO) active **Catalyst Warmup Enabled** Desired cam position Desired AND Measured cam position Desired cam position variation No Active DTCs	= TRUE > 11.00 Volts = TRUE = FALSE = TRUE > 0 deg > 5.00 deg AND < 25.00 deg < 3.00 deg for (**P0011_P05CC_StablePositionTimeIc1**) seconds P0010 P2088 P2089	75 failures out of 100 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.
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 > 5.00 deg.	**Exhaust Cam Phsr Enable**	= TRUE	75 failures out of 100 samples 100 ms /sample	Type B, 2 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	> 5.00 deg AND < 25.00 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.
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 >	1			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 >	0.45588 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 >	0 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 >=	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	
			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.
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 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.
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 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.
Control Module Power Relay Feedback Circuit Low Voltage	P0689	Detects low voltage in the control module relay feedback circuit. This diagnostic reports the DTC when low voltage is present. Monitoring occurs when run crank voltage is above a calibrated value.	Control module relay feedback circuit low voltage	Powertrain relay voltage <= 5.00	Powertrain relay short low diagnostic enable Run Crank voltage Powertrain relay state	= 1.00 > 9.00 = ON	5 failures out of 6 samples 1000 ms / sample	Type C, No SVS

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" No active DTCs:	>= 2.00 seconds PowertrainRelayStateOn_FA	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.
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.
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 #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 > 600 RPM and < 5,750 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 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 #5 Circuit	P06D2	Detects a continuous or intermittent short on the 5 volt reference circuit #5 by monitoring the reference percent Vref5 and failing the diagnostic when the percent Vref5 is too low or too high or if the delta between the filtered percent Vref5 and non-filtered percent Vref5 is too large. This diagnostic only runs when battery voltage is high enough.	ECM percent Vref5 < or ECM percent Vref5 > or the difference between ECM filtered percent Vref5 and percent Vref5 >	4.875 % Vref5 5.125 % Vref5 0.0495 % Vref5	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 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 - 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 = 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.	Fail from passing state: 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] 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**)	Common Criteria: Two Stage Oil Pump is Present Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 5,000 RPM for longer than 60.0 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	TRUE ≥ 5.0 seconds ≥ 70.0 kPa FALSE Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCktFA AmbientAirDefault EngOilTempFA OilPmpTFTKO Enabled : OilPmpTFTKO Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccurate EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA Disabled	≥ 12 errors out of 15 samples. Run once per trip or activiated by the Passive Test	Type B, 2 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	> 1.5 seconds		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Filtered Engine Speed within range	1,500 RPM ≤ Filtered Engine Speed ≤ 3,000 RPM		
					Delta Filtered Engine Speed within a range	ABS [Filtered RPM at beginning of State change - Filtered RPM after 1.0 seconds] ≤ 50 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**)		
					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	27.0 kPa < ABS [**P0521_P06DD_P06DE_ OP_HiStatePressure** - **P06DD_P06DE_OP_LoS tatePressure**] < 270.0 kPa		
					Passive Criteria:			
					Active Test Passed	TRUE		
					Filtered Engine Speed within range	1,100 RPM ≤ Filtered Engine Speed ≤ 4,500 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_Stat eChangeMin** (see P06DD details on Supporting Tables Tab **P06DD_P06DE_OP_Stat eChangeMin**)		
			Fast Pass Condition 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 -	Common Criteria: Two Stage Oil Pump is Present Engine Running	TRUE ≥ 5.0 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 60.0 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 = 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 40.0 deg C ≤ Oil Temp ≤ 110.0 deg C 1,500 RPM ≤ Filtered Engine Speed ≤ 3,000		

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] ≤ 50 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	27.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 270.0 kPa		

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.	<u>Fail from a passing state:</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 1.5 seconds] Oil Pressure delta < **P06DD_P06DE_OP_StateChangeMin** (see P06DE details on Supporting Tables Tab) Filtered Oil Pressure ≤ **P0521_P06DD_P06DE_OP_HiStatePressure** **-** **P06DD_P06DE_OP_LoStatePressure** **) ÷ 2** (see P06DE details on Supporting Tables Tab)	<u>Common Criteria</u>: Two Stage Oil Pump is Present Engine Running Ambient Air Pressure Oil Aeration (= TRUE if engine speed > 5,000 RPM for longer than 60.0 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	TRUE ≥ 5.0 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 Disabled	≥ 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	> 1.5 seconds		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Filtered Engine Speed within range	1,500 RPM ≤ Filtered Engine Speed ≤ 3,000 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] ≤ 50 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	27.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 270.0 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	1,100 RPM ≤ Filtered Engine Speed ≤ 4,500 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 1.5 seconds] Oil Pressure delta <	<u>Common Criteria:</u> Two Stage Oil Pump is Present	TRUE	0 errors out of 5 samples. Run once per trip or activiated by the Passive Test	
					Engine Running	≥ 5.0 seconds		
					Ambient Air Pressure	≥ 70.0 kPa		
					Oil Aeration (= TRUE if engine speed	FALSE		

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)	> 5,000 RPM for longer than 60.0 seconds)			
					No active DTC's for diagnsotic enable:	Fault bundles: MAF_SensorFA ECT_Sensor_FA IAT_SensorFA CrankSensor_FA EngOilPressureSensorCkt FA AmbientAirDefault EngOilTempFA		
					Check oil pump TFTKO as a diagnostic enable when Enabled.	Enabled : OilPmpTFTKO		
					No active DTC's for control :	Enabled Fault bundles for control disable : OilPmpTFTKO EngineTorqueEstInaccura te EngOilPressureSensorFA PowertrainRelayFault CrankSensor_FA EngOilTempFA		
					<u>Active Criteria:</u> One Sided Performance Test = Disabled	Disabled		
					Oil Pump in Low State	> 1.5 seconds		
					Modelled Oil Temperature within range	40.0 deg C ≤ Oil Temp ≤ 110.0 deg C		
					Filtered Engine Speed within range	1,500 RPM ≤ Filtered Engine Speed ≤ 3,000 RPM		
					Engine Torque within range	**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] ≤ 50 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	27.0 kPa < ABS [**P0521_P06DD_P06DE_OP_HiStatePressure** - **P06DD_P06DE_OP_LoStatePressure**] < 270.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Wake-up Circuit Performance Diagnostic (ELCP Sealed/ Vented Fuel System)	P06E4	VICM Wake-up events were not received The ELCP EVAP diagnostics with propulsion system off will run many hours after the vehicle has been shut off when the EVAP system is in a stable condition. Since the ECM does not have the capability to wake itself up, a Vehicle Interface Control Module (VICM) is used to wake up the ECM at predetermined intervals to run the EVAP diagnostics. When the propulsion system transitions to off an alarm request is sent to the VICM. After that period of time has elapsed the VICM alarm clock wakes up the ECM. The ECM then requests another wake up and checks the diagnostic enable conditions. If the enable conditions are met and the EVAP diagnostics are able to complete then the future wake up request will be canceled at the next opportunity when there is communication	Whenever the propulsion system goes active, the diagnostic reads its internal timer and evaluates the results from the wake-up events that could have occurred. For each wake-up event the status can be: Pass – the wake-up event occurred within a window Indeterminate – the ECM was already awake at the time the wake-up event could have occurred Fail – the wake-up event occurred outside a window or did not occur at all If the 5.0 hour wake-up event did not occur from to then a failure has occurred. If the 7.0 hour wake-up event did not occur from to then a failure has occurred. If the 9.5 hour wake-up event did not occur from to then a failure has occurred. At Propulsion System Active, if any of the wake-up events indicate a	4.3 hours 5.8 hours 6.0 hours 8.1 hours 8.2 hours 11.0 hours	Distance since assembly plant Drive distance Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 No Active DTC's	≥ 9.9 miles ≥ 0.1 miles ≥ 0 hours ≥ 0 hours VehicleSpeedSensor_FA ModuleOffTime_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA	Once per each wake-up event when Propulsion System is not active Final decision is made when Propulsion System is Active 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between the VICM and ECM. If the enable conditions are not met then the ECM will go back to sleep and wait for the next wake up to try and run the EVAP diagnostics. There are a total of three wake ups that the ECM can request until there is another transition from propulsion system on to off. This diagnostic indicates if the wake up (s) occurred at the proper requested time (s). A pass will be reported if a wake up occurred at the proper time. A failure will be reported if no wake up occurred, or if a wake up occurred at the incorrect time. The DTC will be indeterminate if the ECM was already awake in a valid window for some reason other than a VICM wake up.	failure then the DTC fails.					

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) OR Serial Communication message ($1C7/$1C9 for engine torque, $1CA/ $1C6 for axle torque) rolling count index value OR Too many minimum limit torque request transitions occur from TRUE to FALSE to TRUE within a time period Torque request greater than torque request diagnostic maximum threshold	Message <> 2's complement of message Message rolling count value <> previous message rolling count value plus one Requested torque intervention type toggles from not increasing request to increasing request > 250 Nm for engine torque based traction torque system, OR > 3,500 Nm for axle torque based traction torque system	Serial communication to EBTCM (U0108) Power Mode Engine Running Status of traction in GMLAN message ($4E9)	No loss of communication = Run = True = Traction Present	>= 8 failures out of 10 Performed on every received message 8 rolling count failures out of 10 samples Performed on every received message >= 3 multi-transitions out of 5 samples. Performed every 200 ms >= 4 out of 10 samples Performed on every received message	Type C, No SVS Safety Special Type C

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.
Fuel Pump Driver Control Module System Voltage Performance	P1002	Detects low system voltage performance of the fuel pump driver control module system. This diagnostic reports the DTC when the absolute value of the difference between the fuel pump driver battery voltage and the fuel pump driver run/crank voltage exceeds a calibrated value.	Fuel Pump Driver Control Module Run Crank voltage low and high	ABS (Fuel Pump Driver Control Module Battery voltage - Fuel Pump Driver Control Module Run Crank voltage) > 3.00	Fuel Tank Zone Module (FTZM) is present on vehicle		50 failures out of 63 samples 12.5 ms / sample	Type X, No MIL
					Fuel Pump Driver Control Module System Voltage Performance diagnostic is enabled	= 1		
					Fuel Tank Zone Module (FTZM) serial messages are available			
					FTZM Run Crank Active is TRUE			
					Starter motor not engaged			
					Sensor Bus relay is commanded ON			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Ignition Switch Run/ Start Position Circuit High	P1007	Detects high voltage of the fuel pump driver control module ignition switch circuit. This diagnostic reports the DTC when the fuel pump driver control module ignition switch circuit voltage exceeds a calibrated value.	Fuel Pump Driver Control Module Ignition switch Run/Start position circuit high	FTZM Run Crank Active is TRUE	Fuel Tank Zone Module (FTZM) is present on vehicle Fuel Pump Driver Control Module Ignition Switch Run/Start Position Circuit High diagnostic is enabled Fuel Tank Zone Module (FTZM) serial messages are available Run Crank Active Sensor Bus relay is commanded ON	 = 1 = FALSE	100 failures out of 125 samples 50 ms / sample	Type X, No MIL

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	> 180 kPa*(g/s) > 12.0 grams/sec > 15.0 kPa) > 15.0 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 <= 5,000 RPM >= -7 Deg C = TRUE) <= 130 Deg C >= -20 Deg C <= 100 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_RCT_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 ≥ 19.0 and < 50.0 ºC ≤ 19.0 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 > 25,200 seconds > 28,800 seconds = Not occurred = False = False = False ≥ -7 ºC = False ================== ≥ 19.0 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 19.0 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	> 100 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 ≥300.0 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)	> 10.00 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.
Radiator Coolant Temperature Sensor Not Plausible	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 =** CeECTR_e_ECT_Snsr (Sensor1 is the temp sensor most impacted by the block heater (if equipped)) **Sensor2 =** CeECTR_e_RCT_Snsr **Sensor3 =** CeECTR_e_OAT_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:	≥ 19.0 ºC ≥ 30.0 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 > 25,200 seconds > 28,800 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.
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.
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.
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 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 420 failures out of 525 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 420 failures out of 525 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	>= 0.04 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	114 failures out of 143 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	>= 0.04 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	114 failures out of 143 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 > 1.94 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	420 failures out of 525 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	50 Failures out of 63 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)		
					<u>Case 1: Battery</u> Delay starting at Key-On	5 Engine Revs		
					<u>Case 2: Ignition Run/ Crank</u> Ignition Run/Crank Voltage	> 5.0 volts		
					<u>Case 3: PT Relay</u> 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) > 7.00 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	< 300.00 degC > -10.00 degC <= 40.00 degC >= 70.00 KPa >= 700.00 degC >= 25.00 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. < 70.00 KPa	Runs once per trip when the cold start emission reduction strategy is active Frequency: 100ms Loop Test completes after 12 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	< 621.37 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	1 (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	> 3.50 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	> 85.00 %		
					Clutch Pedal Position	< 20.00 %		
					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.
Exhaust Gas Recirculation (EGR) Internal Error	P1426	This diagnostic monitors the encoded PWM signal from the Smart EGR Valve. The ECM monitors to determine if the Smart EGR Valve start transmitting the specific PWM Duty Cycle (10%) that indicates it has detected an internal error. The ECM then determines when this conditions has existed long enough to determine the part is faulted.	The smart EGR valve has determined that an internal error exists (internal to the EGR valve). The EGR valve has broadcast the specific duty cycle to indicate internal error conditions exist.	12.01 % > Duty Cycle received from EGR Valve > 8.00 %	Engine RPM Engine RPM Output driver Ignition switch	>= 1,020 RPM <= 4,600 RPM On Crank or Run	> 20 failures 12.50 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.
EGR Temperature Sensor1 vs IAT Not Plausible	P1427	The power up temperature varies too much from reference sensor after long soak. At start up, after a long enough soak time to stabilize temperatures, the EGR 1 temp sensor is compared to the IAT temp sensor. If the temperature delta is above an allowed operating threshold the sensor is determined to be faulted.	If the power up, initial value of the temp sensor varies more than allowed from the reference temp sensor.	Temperature Delta from IAT. at power up > 25 degC	Engine soak (not run) time	>= 28,800.00 Sec	NA	Type B, 2 Trips
					No P codes	P262B P0111 P0114 P010B P00E9 P117D P017C P017D P017B P117B P117F P117E P117C P0116 P0117 P0118 P111E P0128 P0119		
					Ignition switch	Crank or Run		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Temperature Sensor2 vs IAT Not Plausible	P1429	The power up temperature varies too much from reference sensor after long soak. At start up, after a long enough soak time to stabilize temperatures, the EGR 2 temp sensor is compared to the IAT temp sensor. If the temperature delta is above an allowed operating threshold the sensor is determined to be faulted.	If the power up initial value of the temp sensor varies more than allowed from the reference temp sensor.	Temperature Delta from IAT at power up > 25.00 C	Engine soak (not run) time	>= 28,800.00 Sec	NA	Type B, 2 Trips
					No P codes	P262B P0111 P0114 P010B P00E9 P117D P017C P017D P017B P117B P117F P117E P117C P0116 P0117 P0118 P111E P0128 P0119		
					Ignition switch	Crank or Run		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Temperature Sensor "B" Not Plausible	P1437	The Smart EGR valve is requesting a thermal shutdown when conditions do not exist. DETAILED DESCRIPTION: The EGR Valve on this application is a “Smart EGR Valve”. Desired Position, Position Feedback as well as other state communication between the ECM and the Valve are done using an Encoded PWM message. The EGR valve has internal temperature determination that can determine the valve is operating at a temperature that is beyond its range and damage to the valve could occur. GM’s standard is that Smart Components cannot make this determination on their own and the request to shut down decision must be made and rationalized by the ECM. When the EGR believes it is in an	The smart EGR valve has determined that a thermal condition exists where the valve should be shut down for protection but ECM has determined that condition is not plausible. ECM Received duty Cycle of 14% (request from valve to be shutdown due to thermal conditions) but none of the other engine "hot conditions" exist.	16.00 % > Duty Cycle Received from EGR Valve > 12.01 % and NONE of the following conditions exist: Engine Metal Overtemp: Engine Metal Temperature > 131 C for > 2 Sec. Ambient Temperature>= 140 C Catalyst temperature > 940 Piston Protection: RPM > 7,000 RPM and Airflow > **Piston Protection Airflow** and engine coolant > 100 C for >= 7 Sec Hot Coolant Enrichment: Engine coolant >= 120.00 C and Percent throttle area >= 3.00 % and	Engine RPM Engine RPM Output driver Ignition switch	>= 1,020 RPM <= 4,600 RPM On Crank or Run	>= 720 samples 12.50 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.
		elevated temperature conditions where it desires to shut down for protection, it must request it from ECM. This is done by sending a 14% DC message as the Feedback position. The range 12% □ 16% of Feedback Position is held for the Valve request for shutdown. The ECM rationalizes this request with several available known temperatures (calibratable). The request can be rationalized versus: Engine Metal Over temp active flag, Ambient Temperature, Catalyst Temperature, Piston Protection Active, High coolant with elevated RPM and Airflow, Hot coolant enrichment active, Turbo Charger Temperature, Engine Metal temperature, Coolant Temperature, Oil temperature. (Calibratable conditions). If the Valve is requesting temperature shutdown and the ECM determines conditions		Intake Manifold Pressure >= 50.00 kPa and vehicle speed >= 15.00 KPH for >= 2.00 sec Turbo Charger Temperature > 940.00 - **GearDownShftOffset** Engine Metal Temperature > 131.00 for > 2.00 Sec. Engine Coolant Temperature >= 128.00 Engine Oil Temperature >= 140.00				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		are such that the valve can be hot and should be requesting temperature protection the request is honored and the ECM sends the message to the Valve via the encoded PWM desired position message that Valve shutdown is commanded. If the Valve is requesting temperature shutdown and the ECM determines conditions are NOT such that the valve can be hot and that is should NOT be requesting temperature protection the request is Not honored. The ECM continues to send the desired position command to the Valve via the encoded PWM desired position message. Debouncing of the P1437 EGR Temperature Sensor "B" Not Plausible fault starts. If the request message continues while not rationalized for long enough, the P1437 code is set.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Leak Detection Pump Performance /Stuck Off (ELCP Vented Fuel System)	P145C	This DTC will detects an ELCP vacuum pump that is stuck off. The 1st reference vacuum measurement is compared to a minimum expected vacuum change for the ELCP vacuum pump stuck off diagnostic. If the minimum vacuum change is not met then a failure is reported for P145C. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete. In a passing condition, P145C will not report a pass at this time since this diagnostic is run again during the 2nd reference orifice check section. The 2nd reference vacuum measurement is compared to a minimum expected vacuum change for the ELCP vacuum pump stuck off diagnostic. If the minimum vacuum change is not met then a failure is reported for P145C. If a failure is detected then the ELCP EVAP diagnostic test sequence is	When the ELCP vacuum pump is commanded on during the 1st 0.020” reference orifice vacuum measurement, if the stabilized ELCP pressure sensor (gauge) vacuum reading is after then the ELCP vacuum pump is stuck off and the DTC fails. When the ELCP vacuum pump is commanded on during the 2nd 0.020” reference orifice vacuum measurement, if the stabilized ELCP pressure sensor (gauge) vacuum reading is after then the ELCP vacuum pump is stuck off and the DTC fails.	< 100 Pa 360 seconds < 100 Pa 30 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to twice per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		complete. In a passing condition, P145C will report a pass at this time.			Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P0451 P145D P1462 P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Leak Detection Pump Stuck On (ELCP Vented Fuel System)	P145D	This DTC detects an ELCP vacuum pump that is stuck on. Ambient check section For the ELCP vacuum pump stuck on test, the ELCP vacuum pump is off, and the ELCP switching valve is moved from the vent to pump position half way through the test. Utilizing the switching valve allows for proper fault detection whether the ELCP vacuum pump is stuck on before or after the ECM is powered on. The ELCP vacuum pump stuck on test is performed by comparing an initial ELCP pressure sensor reading to a second reading after the ELCP switching valve is moved from the vent to pump position. The ELCP switching valve is moved back to the vent position after the second pressure sensor reading is taken. A large difference between the two pressure sensor readings indicates the	The 1st time in the test sequence when the ELCP vacuum pump is commanded off, after the ELCP switching valve transitions from vent to pump position, if the difference between an initial ELCP pressure sensor (absolute) reading and a second ELCP pressure sensor (absolute) reading is after then the ELCP vacuum pump is stuck on and the DTC fails. The 2nd time in the test sequence when the ELCP vacuum pump is commanded off, if the ELCP pressure sensor (gauge) vacuum reading is after then the ELCP vacuum pump is stuck on and the DTC fails.	> 1,000 Pa 8 seconds > 1,180 Pa 14 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ***************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ***************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ***************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Once or twice per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		ELCP vacuum pump is stuck on and a failure is reported for P145D. The ELCP EVAP diagnostic test sequence is complete if a failure is detected. In a passing condition, P145D will not report a pass at this time since this diagnostic is run again during the final check section.			Or Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm) Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
		Final check section The ELCP vacuum pump stuck on test in the final check section is not the same as in the ambient check section. Activating the ELCP switching valve in the final check section is not necessary since it was determined in the ambient check section that the pump was not stuck on when the ELCP EVAP diagnostic test sequence started.			No Active DTC's TFTK	P043E P043F P0451 P145C P145F P1462 P1463 P2450 P24B9		
		In the final check section, the ELCP vacuum pump stuck on test is performed by comparing the initial ELCP pressure sensor reading to the final reading when the test						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		time is reached. A large difference between the two pressure measurements indicates the ELCP vacuum pump is stuck on and a failure is reported for P145D. The ELCP EVAP diagnostic test sequence is complete if a failure is detected. A pass is reported for P145D if the difference is below the threshold calibration.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Leak Detection Reference Orifice Performance (ELCP Vented Fuel System)	P145F	1st and 2nd 0.020" reference orifice vacuum measurements do not correlate. The reference vacuum is re-checked after the leak detection test sequence is complete. If the absolute difference between the 1st and 2nd reference vacuum measurements is above a threshold then a failure is reported for P145F. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete. If the absolute pressure difference is less than the threshold then a pass is reported. Additional Information The 2nd reference vacuum measurement is similar to the 1st reference vacuum measurement but has a few differences. The 2nd reference vacuum measurement does not need a warm up period like the 1st reference vacuum measurement since the ELCP vacuum pump is	If the difference between the 1st 0.020" reference orifice vacuum measurement and the 2nd 0.020" reference orifice vacuum measurement is after then the 1st and 2nd reference orifice vacuum measurements do not correlate and the DTC fails.	> 550 Pa 30 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to once per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		already warmed up since it has been on for the prior test sequences. There are wider calibration limits for the 2nd reference vacuum measurement to account for vacuum increases that can occur the longer the pump runs during the EVAP leak check section. During this portion of the test the ELCP vacuum pump is on and the ELCP switching valve is in the vent position. Just like in the 1st reference orifice check section, the results are based on average vacuum measurements calculated over a period of time. The measurements and calculations described in the 1st reference orifice check section of the guide also apply to the 2nd reference orifice check section. The 2nd reference orifice check section also includes a comparison between the 1st and 2nd reference vacuum measurements. Large			Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P0451 P145C P145D P1462 P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		differences between these measurements will fail the reference orifice performance diagnostic (P145F).						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative System Leak Detection Reference Orifice Flow Erratic (ELCP Vented Fuel System)	P1462	0.020" reference orifice vacuum measurement is eratic. When the ELCP vacuum pump is on and the ELCP switching valve is in the vent position, the ELCP pressure sensor measures the absolute pressure between the ELCP vacuum pump and the reference orifice. A short period of time before the tests ends an averaged ELCP pressure sensor (absolute) measurement is captured and compared to a final averaged ELCP pressure sensor (absolute) measurement. Large differences between the two values indicates that a stabilized vacuum measurement did not occur and a failure is detected. The vacuum measurements are considered erratic.	While performing 1st 0.020" reference orifice vacuum measurement for or 2nd 0.020" reference orifice vacuum measurement for If the absolute value of the difference between the averaged ELCP pressure sensor (absolute) reading starting before the end of the reference measurement and the final averaged ELCP pressure sensor (absolute) reading is then a stabilized 0.020" reference orifice vacuum measurement could not be obtained and the DTC fails.	360 seconds 30 seconds 3 second 10 seconds 3 second > 220 Pa	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to twice per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P0451 P145C P145D P1463 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP System Leak Detection Pump to Fuel Tank Restriction (ELCP Vented Fuel System)	P1463	Restriction between ELCP vacuum pump and fuel tank. This test determines if there is blockage between the ELCP vacuum pump and fuel tank. A blockage will cause the vacuum level as measured by the ELCP pressure sensor to quickly increase beyond a calibration threshold in a short period of time if there are no other leaks. This makes the EVAP system to appear to have no leaks even though the complete EVAP system is not being tested. If a blockage is detected by the ELCP pressure sensor, the FTP sensor reading during the diagnostic will be used to determine the location of the blockage. When the FTP sensor is located in the fuel tank then information of the location of the blockage is not useful. The FTP sensor reading has no impact on the setting the blockage DTC. It is only a PID output that	If the ELCP pressure sensor (gauge) vacuum reading is greater than the blockage threshold (1st 0.020" reference orifice vacuum measurement times a after a time delay of then a blockage exists between the ELCP vacuum pump and the fuel tank and the DTC fails.	0.57 multiplier) 5 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ****************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to twice per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		aids the service technician. Details Vacuum level measurements over a time period are compared to a blockage threshold. The blockage threshold is calculated by applying a factor to the 1st reference vacuum measurement. When there is no blockage, the increase in vacuum as measured by the ELCP pressure sensor will be slow as compared to a system with a blockage. When there is a blockage, the increase in vacuum as measured by the ELCP pressure sensor will be fast as compared to a system without a blockage and will quickly approach (or exceed) the blockage threshold. If the vacuum level measurement during the blockage check section is greater than the blockage threshold then a fail is reported for P1463 DTC. If a failure is detected then the ELCP EVAP			Or Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm) Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P145C P145D P1462 P2450 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		diagnostic test sequence is complete. A pass is reported for P1463 DTC if the vacuum level measurement is less than the blockage threshold and the blockage test time is reached.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Active Performance (ELCP Vented Fuel System - Active version)	P1464	Fuel Tank Pressure (FTP) Sensor Correlation Diagnostic With Propulsion System Active. Passive Section The passive diagnostic runs when the propulsion system goes active, the vehicle has soaked for a minimum amount of time, the ELCP vacuum pump has been off for a minimum amount of time, and purge is not enabled. The FTP sensor readings are averaged over a period of time and compared to a window near zero pressure/vacuum. This average FTP sensor reading is referred to as the vented vacuum result. If the vented vacuum result is outside the window and the fuel level is below a maximum enable calibration then a fail is reported for P1464. Active Section The vacuum change check of the diagnostic	The passive portion of the diagnostic runs when the propulsion system goes active, the vehicle has soaked for a minimum amount of time, the ELCP vacuum pump has been off for a minimum amount of time, and purge is not enabled. If the 2 second averaged FTP sensor reading (vented vacuum result) is or then a FTP sensor correlation failure has been detected and the DTC fails. OR The active portion of the diagnostic runs during the purge valve flow test sequence when vacuum is being built in the fuel system. If the FTP sensor vacuum change is less than the vented vacuum result (from passive portion of diagnostic) plus a calibration threshold	< -498 Pa > 498 Pa, refer to **P1464 FTP Sensor Correlation Active Pressure Threshold** in Supporting Tables	Propulsion System Active Min baro Max baro Min OAT Max OAT ****************************** Conditions for corrected / estimated ambient temperature using OAT sensor to be valid = TRUE ****************************** Vehicle speed Fuel level Vehicle soak time ELCP pump off time Engine RPM to enable Engine RPM to re-enable Engine vac to enable Engine vac to re-enable Engine airflow to enable Engine airflow to re-enable Purge flow to enable Purge flow to re-enable Purge DC to enable Purge DC to re-enable Requested purge flow to enable Delivered purge flow to re-enable Delivered purge flow to enable Engine Running Run/Crank Voltage Purge is enabled	≥ 70 kPa ≤ 110 kPa ≥ 4 °C ≤ 35 °C ****************************** ****************************** ≥ 31 MPH ≤ 90 % ≥ 0 hours ≥ 0 hours 1,140 ≤ RPM ≤ 4,100 1,160 ≤ RPM ≤ 4,000 8 kPa ≤ vac ≤ 41 kPa 9 kPa ≤ vac ≤ 40 kPa 9 gps ≤ airflow ≤ 45 gps 9 gps ≤ airflow ≤ 44 gps ≥ 0.26 gps ≥ 0.27 gps ≥ 25.0 % ≥ 27.0 % ≥ 3.00 % ≥ 2.85 % ≥ 2.80 % ≥ 11.0 volts	Once per trip with Propulsion System Active and Engine On 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		runs during the purge valve flow test sequence when vacuum is being built in the fuel system. This diagnostic checks for the FTP sensor to indicate a vacuum change greater than the vented vacuum result plus a calibration threshold for a period of time. The vacuum change threshold and the test time are both a function of fuel level. During the test the thresholds are adjusted as the fuel level changes. The diagnostic captures and uses the maximum test time and minimum vacuum change as the thresholds, based on the changing fuel level. After P0497 passes, the switching valve is kept in the pump position until the vacuum change is confirmed or until the test time is reached. When the FTP sensor indicates a vacuum change less than the vented vacuum result plus a calibration threshold for a period of time then a fail is	for a period of time then a FTP sensor correlation failure has been detected and the DTC fails.	refer to **P1464 FTP Sensor Correlation Active Test Time** in Supporting Tables	Abort Conditions: Device control exceeds No Active DTC's No Active DTC's TFTKO	0.5 seconds MAP_SensorFA EnginePowerLimited AmbientAirDefault OAT_EstAmbTemp_FA ModuleOffTimeErr VehicleSpeedSensor_FA FuelLevelDataFault P0442 P0443 P0452 P0453 P0455 P0458 P0459 P0497 P145D P1463 P2400 P2401 P2402 P2418 P2419 P2420 P2450 P24B9 P24BA P24BB		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		reported for P1464. When the FTP sensor indicates a vacuum change greater than the vented vacuum result plus a calibration threshold for a period of time then a pass is reported for P1464. If P0497 does not pass then the FTP sensor correlation diagnostic cannot make a pass/fail decision. The purge priority and engine vacuum request are released once the purge low flow diagnostic, vent restriction diagnostic, and the FTP sensor correlation diagnostic are complete.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 1 Output Circuit (ODM) (EREV/ PHEV only) Open	P1485	Diagnoses the cooling fan 1 output 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	Battery voltage to enable Battery voltage to remain enabled Accessory line is high for No Active DTC's	≥ 11.00 volts ≥ 10.00 volts 5.00 >seconds P2537	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P1486 may also set (Cooling Fan 1 Output Circuit Short to Ground).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 1 Output Circuit Low Voltage (ODM) (EREV/ PHEV only)	P1486	Diagnoses the cooling fan 1 output 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	Battery voltage to enable Battery voltage to remain enabled Accessory line is high for No Active DTC's	≥ 11.00 volts ≥ 10.00 volts 5.00 >seconds P2537	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P1485 may also set (Cooling Fan 1 Output Circuit Open Circuit).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 1 Output Circuit High Voltage (ODM) (EREV/ PHEV only)	P1487	Diagnoses the cooling fan 1 output 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	Battery voltage to enable Battery voltage to remain enabled Accessory line is high for No Active DTC's	≥ 11.00 volts ≥ 10.00 volts 5.00 >seconds P2537	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.
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.
Communication Error with Active Grill Air Shutter Module “A”	P151E	This DTC monitors for an internal error or error in communication with the Active Grill Air Shutter Module A	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	>= 10.00 counts	All the following conditions are met for	>= 3.00 seconds	LIN bus communication executes in 500ms loop	Type B, 2 Trips
			out of total samples	>= 10.00 counts	Power Mode	= Run		
					Powertrain Relay Voltage	>= 11.00 Volts		
					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.
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.
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 0.5 seconds			fail continuously for greater than 0.5 seconds	Type C, No SVS , special type C

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 SVS Special Type C

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 OR 2. Serial Communication rolling count value shall be + 1 from previous $181 message 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 OR Message rolling count value <> previous message rolling count value plus one	Secondary High Speed Bus is Present and No Serial communication loss to HCP (U1817) Run Crank Active Ingintion Voltage > Threshold No Serial communication loss to HCP (U1817) Hybrid Type = Mild, SS or Strong	No loss of communication >= 3.00 Sec > 6.41 = Strong	1. >= 10.00 Protect errors out of 10.00 samples OR 2. >= 10.00 Rolling count errors out of 10.00 samples Pass diagnostic if samples >= 10.00 Performed every received message	Type A, 1 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 SVS , 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 SVS , special type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Control Speed Request Circuit Signal Message Counter Incorrect	P15F9	This DTC monitors for an error in communication with the Torque Request signal in $281	Communication of the Alive Rolling Count or Protection Value in the Torque Request 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.
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	0.00	9.00 / 17.00 counts	Type X, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP System Alarm Clock Signal Not Received (ELCP Sealed/ Vented Fuel System)	P162D	ECM did not receive VICM alarm clock feedback signal The ELCP EVAP diagnostics with propulsion system off will run many hours after the vehicle has been shut off when the EVAP system is in a stable condition. Since the ECM does not have the capability to wake itself up, a Vehicle Interface Control Module (VICM) is used to wake up the ECM at predetermined intervals to run the EVAP diagnostics. When the propulsion system transitions to off an alarm request is sent to the VICM. After that period of time has elapsed the VICM alarm clock wakes up the ECM. The ECM then requests another wake up and checks the diagnostic enable conditions. If the enable conditions are met and the EVAP diagnostics are able to complete then the future wake up request will be canceled at the next opportunity when	Whenever the propulsion system goes active, the diagnostic reads its internal timer and evaluates the results from the wake-up events that could have occurred. If the ECM did not receive feedback from the VICM that the alarm clock was set, the 5.0 hour wake-up event did not occur, and the ECM did not wake up for any reason from to then a failure has occurred. If the ECM did not receive feedback from the VICM that the alarm clock was set, the 7.0 hour wake-up event did not occur, and the ECM did not wake up for any reason from to then a failure has occurred. If the ECM did not receive feedback from the VICM that the alarm clock was set, the 9.5 hour wake-up event did not occur, and the ECM did not wake up for any reason from to then a failure has occurred.	4.3 hours 5.8 hours 6.0 hours 8.1 hours 8.2 hours 11.0 hours	Distance since assembly plant Drive distance Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 No Active DTC's Abort Conditions: Service bay test active	≥ 9.9 miles ≥ 0.1 miles ≥ 0 hours ≥ 0 hours VehicleSpeedSensor_FA ModuleOffTime_FA LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA	Once per each wake-up event when Propulsion System is not active Final decision is made when Propulsion System is Active 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		there is communication between the VICM and ECM. If the enable conditions are not met then the ECM will go back to sleep and wait for the next wake up to try and run the EVAP diagnostics. There are a total of three wake ups that the ECM can request until there is another transition from propulsion system on to off. This diagnostic indicates if the ECM received feedback from the VICM after a wake up request was made. A pass will be reported if feedback was received. A failure will be reported if no wake up occurred and no feedback was received. The DTC will be indeterminate if feedback was not received, but a VICM wake up occurred or the ECM was already awake in a valid window for some reason other than a VICM wake up.	At Propulsion System Active, if any of the wake-up events indicate a failure then the DTC fails.					

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	 >= 11.00 Amps <= 0.50 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 > 0.250 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 >= -20.0 degC -20 <= Temp degC <= 125		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Voltage Correlation #2	P16A7	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.	|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.
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.
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	-175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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	175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Absolute difference of Accessory torque and its redundant calculation is out of bounds given by threshold range	175.00 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.
			Absolute difference of Filtered Air-per-cylinder and its redundant calculation is out of bounds given by threshold range	360.19 mg	Ignition State	Accessory, run or crank	Up/down timer 2,048 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	25.00 degrees		Engine speed >0rpm	Up/down timer 2,048 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 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.
				Nm				
			One step ahead calculation of air-per-cylinder and two step ahead is greater than threshold	80.00 mg		Engine speed > 680 rpm	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Difference between Unmanaged Spark and PACS Spark is greater than threshold	25.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 955.53 Nm Low Threshold -1,433.30 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 955.53 Nm Low Threshold -1,433.30 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of Friction torque and its redundant calculation is out of bounds given by threshold range	175.00 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.
			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 2,048 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 < 7,000.00 or 7,200.00 rpm (hysteresis pair)	Up/down timer 2,048 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 2,048 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 2,048 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	5 cylinders		Engine run flag = TRUE > 2.00 s Number of cylinder events since engine run > 24 No fuel injector faults active	Up/down timer 2,048 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)** + 175.00 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	174.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Engine Immediate Request Without Motor is greater than its redundant calculation plus threshold	174.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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	175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Commanded Predicted Engine Request is greater than its redundant calculation plus threshold	175.00 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	174.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Commanded Hybrid Immediate Crankshaft Request is less than its redundant calculation minus threshold	174.00 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 175 ms continuous, 0.5 down time multipier	
			Cylinder Spark Delta Correction exceeds the absolute difference as compared to Unadjusted Cylinder Spark Delta	25.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			1. Cylinder Torque Offset exceeds step size threshold OR	1. 175.00 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.
			2. Sum of Cylinder Torque Offset exceeds sum threshold	2. 175.00 Nm				
			Engine Capacity Minimum Immediate Without Motor is greater than its dual store plus threshold	175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 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 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	175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Engine Speed Lores Intake Firing (event based) calculation does not equal its redundant calculation	N/A		Engine speed greater than 0rpm	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 Speed Lores Intake Firing timing (event based) calculation does not equal its redundant calculation	N/A		Engine speed greater than 0rpm	Up/down timer 2,048 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)** + 175.00 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.
				175.00 Nm				
			Difference between Driver Requested Immediate Torque primary path and its secondary exceeds threshold	955.53 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	955.53 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	955.53 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	119.44 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	174.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Engine min capacity above threshold	175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 2,048 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 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.
							multipier	
			1. Absolute difference of redundant calculated engine speed above threshold	500 RPM		Engine speed greater than 0 RPM	Up/down timer 2,048 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 2,048 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 2,048 ms continuous, 0.5 down time multipier	
			Desired throttle position greater than redundant calculation plus threshold	10.00 percent	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 2,048 ms continuous, 0.5 down time multipier	
			Throttle desired torque above desired torque plus threshold	175.00 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.
			Desired filtered throttle torque exceeds the threshold plus the higher of desired throttle torque or modeled throttle torque	175.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 87.50 Nm Low Threshold -87.50 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 2,048	

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	164.06 Nm Low Threshold -175.00 Nm Rate of change threshold 10.94 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 175.00 Nm Low Threshold - 175.00 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.
			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 2,048 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 0.0006200 Low Threshold - 0.0006200	Ignition State	Accessory, run or crank	Up/down timer 2,048 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 175.00 Nm Low Threshold - 175.00 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.
			Accessory drive friction torque is out of bounds given by threshold range	High Threshold 175.00 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 25.00 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 175.00	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 - 175.00 Nm			0.5 down time multipier	
			Generator friction torque is out of bounds given by threshold range	High Threshold 175.00 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	175.00 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.
			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 175.00 Nm Low Threshold -175.00 Nm Rate of change threshold 10.94 Nm/loop		Engine speed >0rpm MAF, MAP and Baro DTCs are false	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Torque error compensation is out of bounds given by threshold range	High Threshold 175.00 Nm Low Threshold 0.00 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.
			Delta Torque Baro compensation is out of bounds given by threshold range	High Threshold 5.69 Nm Low Threshold 3.21 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 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. 174.00 Nm 2. N/A 3. 174.00 Nm 4. 174.00 Nm	3. & 4.: Ignition State	1. & 2.: Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 175.00 Nm 3. & 4.: 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.
			above allowable capacity threshold					
			Engine Vacuum 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	
			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 2,048 ms continuous, 0.5 down time multipier	
			Min. Axle Torque Capacity is greater than threshold	-1,437.00 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	955.53 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 2,048 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)** + 175.00 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.
			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 2,048 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 > 0.20 s	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Difference of minimum spark advance limit and	255.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 2,048	

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	25.00 degrees		Engine speed >0rpm	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Absolute difference between Estimated Engine Torque and its dual store are above a threshold	175.00 Nm		Engine speed >0rpm	Up/down timer 2,048 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	175.00 Nm		Engine speed >0rpm	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.
			Difference of desired spark advance for managed torque and its redundant calculation is out of bounds given by threshold range	25.00 degrees		Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 175.00 Nm	Up/down timer 2,048 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	175 Nm		Engine speed >0rpm	Up/down timer 2,048 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 > 680 rpm	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.
				Threshold: 100 ms			multipier	
			Rate limited cruise axle torque request and its dual store do not match within a threshold	119.44 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	955.53 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	1,433.30 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 2,048 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	25.00 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 2,048 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	25.00 degrees		Engine speed >0rpm	Up/down timer 2,048 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 2,048 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 2,048 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 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 Throttle Position and its redundant calculation do not equal		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.
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 X, No MIL
					Power Mode	= Run		
					Powertrain Relay Voltage	>= 11.00 Volts		
					Run/Crank Ignition Voltage	>= 11.00 Volts		
			out of total samples	>= 10 counts				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Driver Intended Brake Torque Fault	P1B12	Detect a rolling count or protection value error in Driver Intended Brake Torque serial data. This is a plausibiliity test that will fail if there are enough X out of Y errors.	X of Y failure, or continuous criteria have been met for rolling count or protection errors for Driver Intended Brake Torque.			Propulsion System is active KeBRKI_b_TrqSerialDataFailEnbl == 1 Value of KeBRKI_b_TrqSerialDataFailEnbl is: 1 . (If 0, this test is disabled) Manufacturer Enable Counter is 0	9 / 17 counts or 0.488 seconds continuous; 25 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.
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.
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 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 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 B, 2 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 B, 2 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 B, 2 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 >= 18 % for >= 1.0 seconds AND the % Authority metric is approaching the failure threshold. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 14 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	<= -98.0 % <= -75.0 % If the P2096 is actively failing then the Average Integral Offset must be > -95.0 % and the Average Total Offset must be > -70.0 % 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 No No >= 70 kPa >= 5.0 g/s <= 10,000.0 >= 25 kPa <= 200 >= -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 360,000	Frequency: Continuous Monitoring in 100ms loop. The Integral and Total Offset % Authority metrics are sampled every 100ms and an average is calculated every 50.0 seconds (500 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 20 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	30		
					Idle	30		
					Cruise	30		
					Light Acceleration	30		
					Heavy Acceleration	30		
					(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 >= 18 % for >= 1.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 14 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	>= 98.0 % >= 70.0 % If the P2097 is actively failing then the Average Integral Offset must be < 95.0 % and the Average Total Offset must be < 60.0 % 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 50.0 seconds (500 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 >	10.00 percent 10.00 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 >	45.00 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.
Vehicle Speed – Output Shaft Speed Correlation	P215B	Detect invalid vehicle speed source. This failure is set by two different conditions. Either the absolute difference between wheel speed vehicle speed and TOS vehicle speed is too high, or secure vehicle speed is not available.	The absolute difference between wheel speed vehicle speed and TOS vehicle speed greater than > OR Secure vehicle speed source is unavailable	6.21 mph		Time since first CAN activity > 0.5000 s Secure vehicle speed source is TOS vehicle speed or wheel speed vehicle speed Trans engaged state is equal to engaged.	400 / 800 counts for wheel speed correlation or 400 / 800 counts for TOS correlation; 25ms/count	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.	0.50 If the diagnostic has reported a failure on the prior trip, the Filtered Ratio must fall below 0.28 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 0.50 .	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 = 0.100 Air Per Cylinder (APC) APC delta during short term sample period	no lower than 10.0 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 1,200 to 3,800 RPM < 250 RPM 5 to 200 g/s < 5 g/s < 0.25 g/s 170 to 500 mg/cylinder < 70 mg/cylinder	Minimum of 1 test per trip, up to 4 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, 15.00 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 = 0.100 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:	< 10.00 percent 0 to 100 degrees 0 to 200 percent 0 to 100 degrees 0 to 100 degrees >= 0.99 >= 1.2 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, 8 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 AIR pump 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 on 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) >= 0.20 >= 0.30 0.10 0.10 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.
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.	**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 B, 2 Trips
			Engine Not Rotating: 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:	> 15.0 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	< 14.4 % of 5 Volt Range (This is equal to 18.1 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 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 115.0 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 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)	> 115 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	< 750 mvolts > 70 grams	No Active DTC's	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	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
					B1S2 DTC's Not active this key cycle	P013A, P013B, P013E, P013F, P2270 or P2271		
					System Voltage	> 10.0 Volts		
					Learned heater resistance	= Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's")		
					ICAT MAT Burnoff delay	= Not Valid		
					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: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 20.0 grams/sec.		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Pedal position	≤ 100.0 %		
					Engine Airflow	0.8 ≤ gps ≤ 50.0		
					Closed loop integral	0.90 ≤ C/L Int ≤ 1.08		
					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	< 140.0 Nm		
					EGR Intrusive diagnostic	= not active		
					All post sensor heater delays	= not active		
					O2S Heater (post sensor) on Time	≥ 30.0 sec		
					Predicted Catalyst temp	550 ≤ ºC ≤ 900		
					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	1,000 ≤ RPM ≤ 3,000		
					Engine Speed range to keep test enabled (after initially enabled)	980 ≤ RPM ≤ 3,300		
					Vehicle Speed to initially enable test	33.6 ≤ MPH ≤ 77.7		
					Vehicle Speed range to keep test enabled (after initially enabled)	24.9 ≤ MPH ≤ 80.8		
					=================			
					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	0.95 ≤ EQR ≤ 1.10		
					Crankshaft Torque	< 110.0 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 > 25.0 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 20.0 grams/sec.		
					Low Fuel Condition Only when FuelLevelDataFault	= False = 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.
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	True	Positive Pressure Error - 10.00 second failures out of 12.50 second samples	Type A, 1 Trips
					Battery Voltage	>= 11 Volts		
					Low Side Fuel Pressure	> 0.250 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) 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	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.
					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 >= -20.0 degC -20 <=Temp degC <= 125		

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	> 0.250 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 >= -20.0 DegC -20 <= Temp degC <= 125		

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.	 $\leq$ 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.	$\leq$ 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 #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.	≤ 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.	$\leq$ 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 #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.	 ≤ 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.	$\leq$ 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.
Evaporative Emission System Leak Detection Pump Control Open Circuit (ELCP Vented Fuel System)	P2400	Controller specific output driver circuit diagnoses the leak detection 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			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.
Evaporative Emission System Leak Detection Pump Control Circuit Low (ELCP Vented Fuel System)	P2401	Controller specific output driver circuit diagnoses the leak detection 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.	≤ 0.5 Ω impedence between signal and controller ground			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.
Evaporative Emission System Leak Detection Pump Control Circuit High (ELCP Vented Fuel System)	P2402	Controller specific output driver circuit diagnoses the leak detection 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. If the P2402 is active, an intrusive test is performed with the pump commanded on 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.
Evaporative Emission System Switching Valve Control Open Circuit (ELCP Vented Fuel System)	P2418	Controller specific output driver circuit diagnoses the switching valve 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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Switching Valve Control Circuit Low (ELCP Vented Fuel System)	P2419	Controller specific output driver circuit diagnoses the switching valve 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.	 ≤ 0.5 Ω impedence between signal and controller ground			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.
Evaporative Emission System Switching Valve Control Circuit High (ELCP Vented Fuel System)	P2420	Controller specific output driver circuit diagnoses the switching valve 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. If the P2420 is active, an intrusive test is performed with the switching valve commanded on 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.
ELCP Switching Valve Control Performance (ELCP Vented Fuel System)	P2450	This DTC detects a ELCP switching valve that is stuck. After the 1st reference vacuum measurement is complete, the ELCP switching valve transitions to the pump position. With a vented fuel system and a correctly functioning ELCP switching valve there will be a significant vacuum drop followed by a slow vacuum increase. The ELCP switching valve performance diagnostic compares the change (either a decrease or increase) from the 1st reference vacuum measurement to a threshold. If the change is less than the threshold then a fail is reported for P2450. If a failure is detected then the ELCP EVAP diagnostic test sequence is complete.	When the ELCP vacuum pump is commanded on and the ELCP switching valve transitions from vent to pump position, if the difference between the 1st 0.020” orifice reference vacuum measurement and the ELCP pressure sensor (gauge) vacuum reading is after then the ELCP switching value is stuck and the DTC fails.	< 400 Pa 5 seconds	Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ***************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ***************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or Service bay test active Or Device control exceeds	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ***************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds 0.5 seconds	Up to once per trip, for each required wake-up event 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Or Vacuum Refueling Detected (See P0454 Fault Code for information on vacuum refueling algorithm) Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling)			
					No Active DTC's	FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA		
					No Active DTC's TFTKO	P043E P043F P145C P145D P1462 P24B9		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EGR Cooler Efficiency (Performance)	P2457	Diagnose EGR Cooler Heat Transfer Efficiency. The efficiency of the EGR cooler is determined by deciding the temperature drop of the EGR gasses before to after the EGR cooler relative to the coolant's ability to absorb the heat. If the cooler is not removing an acceptable amount of heat relative to what it should be able to remove the difference between the EGR gas temperature before the cooler relative to the Coolant temperature, the cooler is determined to be faulted. Diagnose EGR Cooler Heat Transfer Efficiency.	The ECM monitors the heat transfer efficiency from the exhaust gas to the coolant. if the efficiency drops below a calibrated level, the fault is set.	**Calculated instantaneous efficiency:** [((Up Stream temp - Down Stream temp) / (Up Stream temp - Coolant temp)) % + **EGR Efficiency Flow Offset**] **SUM over** 800 **samples:** **Determine Average efficiency:** Summation efficiency / 800 samples **Fail Threshold:** < 81.00 % efficient	Ignition switch System supply voltage Up stream exhaust gas temperature RPM BARO Ambient Temperature Coolant Temperature No Active DTCs	Crank or Run > 11.00 Volts > 165 C < 600 C > 1,100 RPM < 4,000 RPM > 70 kPa > -7 C > 65.00 C AND < 128.00 C P041E, P041C, P041D, P041B, P040E, P040C P040D, P040B, P0070, P0071, P0072, P0073, P2229, P2228, P222C, P222D, P0116, P0117, P0118, P0119, P111E P0128, P0101, P0102, P0103, P010B, P010C, P010D, P0403, P0489, P0490, P0404, P0405, P0406, P042E, P1426, P1437, P0107, P0108, P00C7, P0106, P2228, P2229, P0237, P0238, P0016, P0017, P0018, P0019, P0335, P0336, P0261, P0262, P0264, P0265, P0266, P0267, P0270, P0271, P0273, P0274, P0276, P0277, P0279, P0280, P0282, P0283, P0201, P0202,	800 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.
						P0203, P0204, P0205, P0206, P0207, P0208, P2147, P2148, P2150, P2151, P2153, P2154, P2156, P2157, P216B, P216C, P216E, P216F, P217B, P217C, P217E, P217F, P012B, P012C, P012D, P0300, P0351, P0352, P0353, P0354, P0355, P0356, P0357, P0358, P2300, P2301, P2303, P2304, P2306, P2307, P2309, P2310, P2312, P2313, P2315, P2316, P2318, P2319, P2321, P2322		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Leak Detection Pump Pressure Sensor Circuit Performance Diagnostic (ELCP Vented Fuel System)	P24B9	ELCP Pressure Sensor Correlation Diagnostic The ambient check section The correlation of the ELCP pressure sensor to barometric pressure follows the ELCP vacuum pump stuck on diagnostic. For this diagnostic the ELCP vacuum pump is off and the ELCP switching valve is in the vent position. The ELCP pressure sensor correlation is a X out of Y diagnostic that runs for a period of time. During this time, the ELCP pressure sensor reading is compared to the barometric pressure sensor. Large deviations will increment the fail counter and a failure is reported for P24B9 when the fail count threshold is exceeded. The ELCP EVAP diagnostic test sequence is complete if a failure is detected. In a passing condition, P24B9 will not report a pass at this time since this diagnostic is run	Propulsion System Not Active If the difference between the ELCP pressure sensor (absolute) reading and the barometric pressure value from the MAP sensor is then increment the fail counter. This diagnostic runs for	> 3,000 Pa 14 seconds.	Propulsion System Not Active Propulsion system not active time Distance since assembly plant Drive distance Min baro Max baro Min fuel level Max fuel level ECT Min IAT Max IAT Time since last test when passing P0442/P0455 Time since last test when failing P0442/P0455 ****************************** ELCP hardware can be powered by battery or powertrain relay. For this application the ELCP hardware is powered by battery Voltage ****************************** Vehicle speed Propulsion system not active time Previous propulsion system active time Abort Conditions: Key up during test Or	4.3 ≤ time ≤ 5.8 hours or 6.0 ≤ time ≤ 8.1 hours or 8.2 ≤ time ≤ 11.0 hours ≥ 9.9 miles ≥ 0.1 miles ≥ 70 kPa ≤ 110 kPa ≥ 10 % ≤ 90 % ≤ 40 °C ≥ 4 °C ≤ 45 °C ≥ 0 hours ≥ 0 hours ***************************** ≥ 10 volts ***************************** ≤ 3 MPH ≥ 0 seconds ≥ 0 seconds	Once or twice per trip with Propulsion System Not Active, for each required wake-up event First time diagnostic runs, 50 failures out of 63 samples Second time diagnostic runs, 50 failures out of 63 samples 100 msec loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		again during the final check section. The final check section The correlation of the ELCP pressure sensor to barometric pressure is the same as in the ambient check section. For this diagnostic the ELCP vacuum pump is off and the ELCP switching valve is in the vent position. The ELCP pressure sensor correlation is a X out of Y diagnostic that runs for a period of time. During this time, the ELCP pressure sensor reading is compared to the barometric pressure sensor. Large deviations will increment the fail counter and a failure is reported for P24B9 when the fail count threshold is exceeded. The ELCP EVAP diagnostic test sequence is complete if a failure is detected. When the sample counter exceeds the sample count threshold then a pass is reported for P24B9.			Service bay test active Or Device control exceeds Or Fuel Level Refueling Detected (See P0464 Fault Code for information on fuel level refueling) No Active DTC's No Active DTC's TFTKO	 0.5 seconds FuelLevelDataFault IAT_SensorFA ECT_Sensor_FA VehicleSpeedSensor_FA AmbientAirDefault ELCPCircuit_FA FTP_SensorCircuit_FA ELCP_PumpCircuit_FA ELCP_SwitchCircuit_FA VICM_WakeupDiag_FA VICM_WakeupDiag_TFTKO LostCommBCM_FA LostCommBusB_VICM_FA CommBusAOff_VICM_FA CommBusBOff_VICM_FA AccCktLo_FA ModuleOffTime_FA P043E P043F P0451 P145C P145D P145F P1462 P1463 P2450		
			Propulsion System Active		Propulsion System Active		When Propulsion	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			After a stabilization time of When a recent barometric pressure update has occurred within the last if the difference between the ELCP pressure sensor (absolute) reading and the barometric pressure value from the MAP sensor is then increment the fail counter. When a recent barometric pressure update has not occurred within the last if the difference between the ELCP pressure sensor (absolute) reading and the barometric pressure value from the MAP sensor is then increment the fail counter.	10 seconds. 0.1 miles, > 15,000 Pa 0.1 miles, > 20,000 Pa	Min baro Max baro Min OAT **************************** Conditions for corrected / estimated ambient temperature using OAT sensor to be valid = TRUE **************************** Vehicle speed Run/Crank Voltage Purge is not enabled Abort Conditions: Device control exceeds Purge Low Flow diagnostic (P0497) is running Canister Vent Restriction diagnostic (P0446) is running FTP Sensor Correlation Active diagnostic (P1464) is running No Active DTC's No Active DTC's TFTKO	≥ 70 kPa ≤ 110 kPa ≥ 4 °C **************************** **************************** ≥ 31 mph ≥ 11.0 volts 0.5 seconds MAP_SensorFA EnginePowerLimited AmbientAirDefault OAT_EstAmbTemp_FA VehicleSpeedSensor_FA P0443 P0458 P0459 P145D P2400 P2401 P2402 P2418 P2419	System Active 50 failures out of 63 samples 100 msec loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P2420 P2450 P24BA P24BB		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Leak Detection Pump Pressure Sensor Circuit Low Voltage (ELCP Sealed/ Vented Fuel System)	P24BA	This DTC will detect an ELCP pressure sensor signal that is too low out of range. The ELCP pressure 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 P24BA DTC. A pass is reported for P24BA DTC if the low sample counter reaches its threshold.	ELCP pressure sensor signal	< 0.70 volts (14.0 % of Vref or ~ 47 kPa)			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.
Evaporative Emission System Leak Detection Pump Pressure Sensor Circuit High Voltage (ELCP Sealed/ Vented Fuel System)	P24BB	This DTC will detect an ELCP pressure sensor signal that is too high out of range. The ELCP pressure 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 P24BB DTC. A pass is reported for P24BB DTC if the high sample counter reaches its threshold.	ELCP pressure sensor signal	> 4.85 volts (97.0 % of Vref or ~ 120 kPa)			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.
Ignition Switch Accessory Position Circuit Low (EREV/ PHEV only)	P2537	Detects a low ignition switch accessory position curcuit. This diagnostic reports the DTC when this circut is low. Monitoring occurs when the propulsion system has been active for a calibrated duration.	The ECM detects that the state of the accessory line is low when it should be high. The diagnostic is evaluated when Propulsion System Active time is > 5.0 seconds. Diagnostic fails when pass counts are	< 8 counts.			12.5 ms / sample 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.
Brake System Control Module Requested MIL Illumination	P25A2	Monitors the Brake System Control Module MIL request message to determine when the Brake System Control Module has detected a MIL illuminating fault.	Brake System Control Module Emissions-Related DTC set and module is requesting MIL	Brake System 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.
Brake System Control Module B Requested MIL Illumination	P25C9	Monitors the Brake System Control Module B MIL request message to determine when the Brake System Control Module B has detected a MIL illuminating fault.	Brake System Control Module B Emissions-Related DTC set and module is requesting MIL	Brake System Control Module B 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.
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.
Crankshaft Position Signal Output Circuit Low	P2618	Controller specific output driver circuit diagnoses the crankshaft position 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 short to ground failure.	Short to ground: <= 0.5 Ohms impedance between signal and controller ground Open Circuit: >= 200 K Ohms impedance between signal and controller ground	Powertrain Relay Voltage Engine is not cranking Crankshaft Position Output is commanded high	>= 11.0 Volts	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips Note: In certain controllers P2617 may also set (Crankshaft Position Signal Output Circuit / Open)

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.
Control Module Communication on Bus A Off	U0073	This DTC monitors for a BUS A off condition	Bus off failures exceeds before the sample time of is reached	5 counts (equivalent to 0.06 seconds) 0.56 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 CAN hardware is bus OFF for	Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 0 (1 indicates enabled) = Active > 11.00 Volts > 0.1125 seconds	Diagnostic runs in 12.5 ms loop	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 DTC monitors for a BUS B off condition	Bus off failures exceeds before the sample time of is reached	5 counts (equivalent to 0.06 seconds) 0.56 seconds	General Enable Criteria: U0074 Normal CAN transmission on Bus B 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 CAN hardware is bus OFF for	 Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 0 (1 indicates enabled) = Active > 11.00 Volts > 0.1125 seconds	Diagnostic runs in 12.5 ms 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 Anti-Lock Brake System (ABS) Control Module	U0121	This DTC monitors for a loss of communication with the Anti-Lock Brake System (ABS) Control Module (Non-OBD Module ID 243).	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type C, No SVS "Special Type C"
			Message $0C1	≥ 10.0 seconds	U0073	Not Active on Current Key Cycle		
			Message $0C5	≥ 10.0 seconds	Normal CAN transmission on Bus A	Enabled		
			Message $1C7	≥ 10.0 seconds	Device Control	Not Active		
			Message $1E9	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $2F1	≥ 10.0 seconds	Ignition Voltage Criteria:			
			Message $2F9	≥ 10.0 seconds	Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 0 (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			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Network Management is not active for	> 0.4000 seconds		
					U0121	Not Active on Current Key Cycle		
					Anti-Lock 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 Brake System Control Module	U0129	This DTC monitors for a loss of communication with the Brake System Control Module (OBD Module ID 7E5).	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips "Special Type C"
					U0073	Not Active on Current Key Cycle		
			Message $0C1	≥ 10.0 seconds	Normal CAN transmission on Bus A	Enabled		
			Message $0C5	≥ 10.0 seconds				
			Message $0D1	≥ 10.0 seconds	Device Control	Not Active		
			Message $1C6	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $1C7	≥ 10.0 seconds	Ignition Voltage Criteria:			
			Message $1E9	≥ 10.0 seconds				
			Message $2F1	≥ 10.0 seconds	Run/Crank Ignition voltage	> 6.41 Volts		
			Message $2F9	≥ 10.0 seconds				
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 0 (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		
					U0129	Not Active on Current Key Cycle		
					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 Body Control Module	U0140	This DTC monitors for a loss of communication with the Body Control Module.	Message is not received from controller for Message $0F1 Message $12A Message $1E1 Message $1F1 Message $1F3 Message $3C9 Message $3CB Message $3F1 Message $451 Message $4D7 Message $4E1 Message $4E9	 ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 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 for	 Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 0 (1 indicates enabled) = Active > 11.00 Volts > 0.4000 seconds	Diagnostic runs in 12.5 ms loop	Type C, No SVS "Special Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					U0140	Not Active on Current Key Cycle		
					Body 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	U0293	This DTC monitors for a loss of communication with the Hybrid Powertrain Control Module.	Message is not received from controller for Message $0B4 Message $0D3 Message $186 Message $1DF Message $3C1	 ≥ 10.0 seconds ≥ 0.5 seconds ≥ 0.5 seconds ≥ 0.5 seconds ≥ 0.5 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 = 0 (1 indicates enabled) = Active > 11.00 Volts	Diagnostic runs in 12.5 ms loop	Type A, 1 Trips

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		
					U0293	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.
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 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	>= 400.00 milliseconds	LIN bus communication executes in 500ms loop	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.
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
			Message $0A7	≥ 0.5 seconds	U0074	Not Active on Current Key Cycle		
			Message $1E3	≥ 0.5 seconds	Normal CAN transmission on Bus B	Enabled		
			Message $281	≥ 0.5 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	= 0 (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.
Lost Communication With Hybrid Powertrain Control Module B on Bus B	U182D	This DTC monitors for a loss of communication with the Hybrid Powertrain Control Module B 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 $1D8	≥ 10.0 seconds	Normal CAN transmission on Bus B	Enabled		
			Message $3C5	≥ 10.0 seconds	Device Control	Not Active		
			Message $3DA	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $3FF	≥ 10.0 seconds	Ignition Voltage Criteria:			
			Message $4C2	≥ 10.0 seconds	Run/Crank Ignition voltage	> 6.41 Volts		
					Power Mode	= run		
					Off Cycle Enable Criteria:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 0 (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		
					U182D	Not Active on Current Key Cycle		
					Hybrid Powertrain Control Module B (VICM)	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 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 Message $0D5 Message $0D7	 ≥ 10.0 seconds ≥ 10.0 seconds	General Enable Criteria: U0074 Normal CAN transmission on Bus B 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 = 0 (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.
					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.
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

**** 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 = 1 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 = 65 - 0.0 – 1
OBD Coolant Enable Temp = 64.0

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(85.0 - 35 , 65) - 0.0 – 1
OBD Coolant Enable Temp = 64.0

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 > (1,400.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (1,400.0 + supporting table value **DFCO_EngSpdEnblOfst**)
POPD ON:
i) enabled when engine speed > (1,000.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (1,000.0 + supporting table value **DFCO_EngSpdEnblOfst**)
TORQUE CONVERETR CLUTCH LOCK
POPD OFF:
i) enabled when engine speed > (1,000.0 + 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 > (1,000.0 + supporting table value **DFCO_EngSpdEnblOfst**)
ii) once enabled continue to be enabled until engine speed < (1,000.0 + 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 <= 1.0
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 > 5.0
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 < 870.0 °C and vehicle speed < 50.0 kph)
b) CatTemp < 900.0 °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 (TRUE)]

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

-40.00 < Engine Oil Temp < 135.00 deg C

ExhEngineOilTemp is Disabled when
Engine Oil Temp < -45.00 deg C
OR
Engine Oil Temp > 140.00 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_LoRpmHiEnblIc < Engine RPM < **P0011_P0021_P05CC_P05CD_HiEngSpdLoEnblIc**

IntEngineSpeed is Disabled when

Engine RPM < **P0011_P0021_P05CC_P05CD_LoRpmLoDsblIc**
OR
Engine RPM > **P0011_P0021_P05CC_P05CD_HiEngSpdHiDsblIc**

****
If an oil pressure sensor is present (TRUE) and is being used (TRUE) then

IntOilPressureEnable is Enabled when
Oil Pressure > **P0011_P0021_P05CC_P05CD_LoPresHiEnblIc** kPa
for **P0011_P0021_P05CC_P05CD_EngOilPressEnblIc** seconds

IntOilPressureEnable is Disabled when
Oil pressure < **P0011_P0021_P05CC_P05CD_LoPresLoDsblIc**

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_LoRpmHiEnblIc**
for **P0011_P0021_P05CC_P05CD_EngOilPressEnblIc** seconds

****
IntEngineOilTemp is Enabled when

-40.00 < Engine Oil Temp < 135.00 deg C

IntEngineOilTemp is Disabled when
Engine Oil Temp < -45.00 deg C
OR
Engine Oil Temp > 140.00 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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	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	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
1,200	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
1,600	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2,000	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2,400	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2,800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
3,200	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
3,600	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4,000	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4,400	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4,800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
5,200	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
5,600	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
6,000	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
6,400	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
6,800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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	200	200	190	180	180	170	170	170	170	170	170	170	170	170	180	180	190

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	120	120	110	110	100	100	100	100	100	100	100	100	110	110	120	120	120

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	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450

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	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325

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	3	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0

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	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
1,200	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
1,600	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
2,000	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
2,400	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
2,800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
3,200	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
3,600	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
4,000	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
4,400	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
4,800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
5,200	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
5,600	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
6,000	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
6,400	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
6,800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0

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	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
1,200	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
1,600	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2,000	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2,400	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2,800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
3,200	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
3,600	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4,000	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4,400	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4,800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
5,200	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
5,600	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
6,000	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
6,400	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
6,800	21.0	21.0	21.0	10.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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	200	200	190	180	180	170	170	170	170	170	170	170	170	170	180	180	190

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	120	120	110	110	100	100	100	100	100	100	100	100	110	110	120	120	120

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	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450

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	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325

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	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
1,200	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
1,600	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
2,000	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
2,400	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
2,800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
3,200	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
3,600	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
4,000	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
4,400	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
4,800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
5,200	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
5,600	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
6,000	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
6,400	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0
6,800	100.0	80.0	20.0	12.0	9.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	8.0

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 - 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	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	6,400
1	0.840	0.840	0.840	0.920	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	6,400
1	0.600	0.600	0.920	0.850	0.920	1.000	1.000	1.000	1.000	1.000	1.000	0.880	0.760	0.880	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	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	6,400
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 - P0401_SamplesAfterReset

Description: Total number of samples allowed after a reset. A greater number of samples allows the EWMA logic to make a decision sooner after a reset. Also used as the threshold of total sample counts above which a test can be considered complete for a particular trip. This is a function of barometric pressure to allow compliant response at different altitudes.

Value Units: Total number of samples allowed after a reset (samples)
X Unit: Barometric pressure (kPa)

y/x	65	70	75	80	85	90	95	100	105
1	10	10	10	10	10	10	10	10	10

Initial Supporting table - P0401_SamplesAfterStep

Description: Total number of samples needed after a step change. A greater number of samples allows the EWMA logic to make a decision sooner after a step change. Also used as the threshold of total step counts above which a test can be considered complete for a particular trip. This is a function of barometric pressure to allow compliant response at different altitudes.

Value Units: Total number of samples needed after a step change(samples)
X Unit: Barometric pressure (kPa)

y/x	65	70	75	80	85	90	95	100	105
1	15	15	15	15	15	15	15	15	15

Initial Supporting table - P0401_StepDelta

Description: Minimum difference between MAP difference and EWMA to trigger multiple tests for step change.This is a function of barometric pressure to allow compliant response at different altitudes.

Value Units: Minimum difference between MAP difference and EWMA (kPa)
X Unit: Barometric pressure (kPa)

y/x	65	70	75	80	85	90	95	100	105
1	15	15	15	15	15	15	15	15	15

Initial Supporting table - P0401_StepMAP_DIFF

Description: Minimum value of MAP difference to trigger multiple tests for step change.This is a function of barometric pressure to allow compliant response at different altitudes.

Value Units: Minimum value of MAP difference (kPa)
X Unit: Barometric pressure (kPa)

y/x	65	70	75	80	85	90	95	100	105
1	2	2	2	2	2	2	2	2	2

Initial Supporting table - P0401_StepSamplesPerTrip

Description: Maximum number of samples per trip after a step change. Also used as the threshold of trip step counts above which a test can be considered complete for a particular trip. This is a function of barometric pressure to allow compliant response at different altitudes.

Value Units: Maximum number of samples per trip after a step change (samples)
X Unit: Barometric pressure (kPa)

y/x	65	70	75	80	85	90	95	100	105
1	3	3	3	3	3	3	3	3	3

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	25	25	25	25	25
0.125	25	25	25	25	25
0.250	25	25	25	25	25
0.375	25	25	25	25	25
0.500	25	25	25	25	25
0.625	25	25	25	25	25
0.750	25	25	25	25	25
0.875	25	25	25	25	25
1.000	25	25	25	25	25

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	3	3	5	11	16	21	27	32
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	3	3	5	11	16	21	27	32

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	600	700	770	800	850	900	930	950	970	990	1,000	1,050	1,100	1,250	1,400	1,600	2,000
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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	-15	-10	-8	-5	-4	-3	5	15
1	10.00	10.00	10.00	9.94	9.13	4.00	1.00	1.00	1.00

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	82	85	89	95	100	110	120	150	200	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	6,400
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	577	481	386	258	163	163	163

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	521	445	369	267	191	191	191

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	500.000	500.000	1,000.000	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	30.00	30.00	30.00	30.00	30.00	30.00

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	125.00	117.30	143.22	167.17	138.41	128.81	115.31	95.13	88.02	89.64	86.08	86.08	86.08	86.08	86.08	86.08
160.00	125.00	125.00	93.73	107.61	123.13	108.56	94.81	85.09	73.30	65.80	63.38	63.28	63.28	63.28	63.28	63.28	63.28
240.00	125.00	125.00	78.09	86.06	96.09	89.31	75.03	67.42	57.30	51.80	49.09	50.03	50.03	50.03	50.03	50.03	50.03
320.00	125.00	125.00	66.95	71.59	77.39	74.36	62.03	55.17	46.22	42.48	40.05	41.38	41.38	41.38	41.38	41.38	41.38
400.00	125.00	125.00	57.38	60.64	64.69	61.73	51.78	45.83	38.66	35.33	33.25	34.31	34.31	34.31	34.31	34.31	34.31
480.00	125.00	125.00	48.94	51.88	55.47	52.50	43.72	39.14	33.20	30.14	28.33	29.16	29.16	29.16	29.16	29.16	29.16
560.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
640.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
720.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
800.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
880.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
960.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,040.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,120.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,200.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,280.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,360.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52

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	-30.00	-20.00	-10.00	0.00	50.00	90.00
500.00	250.00	250.00	250.00	250.00	250.00	250.00
600.00	250.00	250.00	250.00	250.00	189.66	190.13
700.00	250.00	250.00	250.00	250.00	147.94	147.93
800.00	227.84	220.86	250.00	241.38	119.06	118.72
900.00	211.36	204.38	250.00	222.58	107.71	107.24
1,000.00	193.05	186.07	228.26	197.88	91.40	90.14
1,100.00	181.30	173.49	209.45	178.35	74.93	73.57
1,200.00	160.71	150.65	178.43	150.73	50.80	48.86
1,300.00	146.48	134.96	160.05	149.12	50.20	47.96
1,550.00	128.72	117.03	139.92	143.42	47.86	45.04
1,800.00	94.31	85.42	100.93	110.72	30.60	27.96
2,050.00	69.53	61.03	71.18	75.99	17.22	15.40
2,550.00	52.89	46.48	57.01	62.59	8.34	7.35
3,050.00	37.31	31.25	42.24	48.72	-4.46	-4.46
4,050.00	34.17	28.09	39.07	45.56	-7.75	-7.75
6,050.00	25.74	19.61	30.59	37.08	-16.50	-16.50
6,400.00	24.13	18.00	28.98	35.47	-18.11	-18.11

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	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	860

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	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	37

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	1,000

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	1,056

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	20.0	20.0	20.0	20.0	20.0	20.0

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	409.0	409.0	215.0	170.0	170.0	75.0	75.0	75.0	75.0	75.0	75.0	40.0	40.0	40.0	40.0	40.0	40.0

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	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 - 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	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	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	360.0	300.0	250.0	180.0	103.0	30.0	30.0	20.0	15.0	4.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P043E First Reference Orifice Measurement

Description: First reference orifice measurement maximum value as a function of barometric pressure

Value Units: First reference orifice measurement maximum (kPa)
X Unit: Barometric pressure (kPa)

y/x	70	80	90	100	110
1	3.7	3.8	3.9	4.0	4.0

Initial Supporting table - P043E Second Reference Orifice Measurement

Description: Second reference orifice measurement maximum value as a function of barometric pressure

Value Units: Second reference orifice measurement maximum value (kPa)
X Unit: Barometric pressure (kPa)

y/x	70	80	90	100	110
1	4.2	4.3	4.4	4.6	4.6

Initial Supporting table - P043F First Reference Orifice Measurements

Description: First reference orifice measurement minimum value as a function of barometric pressure

Value Units: First reference orifice measurement minimum value (kPa)
X Unit: Barometric pressure (kPa)

y/x	70	80	90	100	110
1	1.2	1.3	1.4	1.5	1.5

Initial Supporting table - P043F Second Reference Orifice Measurements

Description: Second reference orifice measurement minimum value as a function of barometric pressure

Value Units: Second reference orifice measurement minimum value (kPa)
X Unit: Barometric pressure (kPa)

y/x	70	80	90	100	110
1	1.2	1.3	1.4	1.5	1.5

Initial Supporting table - P1464 FTP Sensor Correlation Active Pressure Threshold

Description: FTP sensor correlation active pressure threshold as a function of fuel level

Value Units: Pressure threshold (Pa)
X Unit: Fuel level (percent)

y/x	1	2	3	4	5	6	7	8	9
1	498	498	498	498	498	498	498	498	498

Initial Supporting table - P1464 FTP Sensor Correlation Active Test Time

Description: FTP sensor correlation active test time as a function of fuel level

Value Units: Test time value (seconds)
X Unit: Fuel level (percent)

y/x	10	20	30	40	50	60	70	80	90
1	8	8	8	8	8	8	8	8	8

Initial Supporting table - P057B KtBRKI_K_CmpltTestPointWeight

Description:

y/x	0.000	0.030	0.040	0.250	0.350	0.450	0.550	0.750	1.000
1	0	1	1	1	1	1	1	1	1

Initial Supporting table - P057B KtBRKI_K_FastTestPointWeight

Description:

y/x	0.000	0.030	0.040	0.250	0.350	0.450	0.550	0.750	1.000
1	0	1	1	1	1	1	1	1	1

Initial Supporting table - DFCO_CoolEnblHi_Temp

Description:

y/x	-40	0	25
1	0.0	0.0	0.0

Initial Supporting table - DFCO_DelayAfterStart_Time

Description:

y/x	-30	-8	20	60	90
1	50.0	39.0	20.0	5.0	2.5

Initial Supporting table - DFCO_DsblLo_Vehicle_Speed

Description:

y/x	CeTCOR_e_NonEcoMode	CeTCOR_e_EcoMode
CeTGRR_e_TransGr1	0	0
CeTGRR_e_TransGr2	0	0
CeTGRR_e_TransGr3	0	0
CeTGRR_e_TransGr4	0	0
CeTGRR_e_TransGr5	0	0
CeTGRR_e_TransGr6	0	0
CeTGRR_e_TransGr9	0	0
CeTGRR_e_TransGr10	0	0
CeTGRR_e_TransGrNeut	0	0
CeTGRR_e_TransGrRvrs	0	0
CeTGRR_e_TransGrPark	0	0
CeTGRR_e_TransGr7	0	0
CeTGRR_e_TransGr8	0	0

Initial Supporting table - DFCO_EnblHi_Vehicle_Speed

Description:

y/x	CeTCOR_e_NonEcoMode	CeTCOR_e_EcoMode
CeTGRR_e_TransGr1	0.0	0.0
CeTGRR_e_TransGr2	0.0	0.0
CeTGRR_e_TransGr3	0.0	0.0
CeTGRR_e_TransGr4	0.0	0.0
CeTGRR_e_TransGr5	0.0	0.0
CeTGRR_e_TransGr6	0.0	0.0
CeTGRR_e_TransGr9	0.0	0.0
CeTGRR_e_TransGr10	0.0	0.0
CeTGRR_e_TransGrNeut	0.0	0.0
CeTGRR_e_TransGrRvrs	0.0	0.0
CeTGRR_e_TransGrPark	0.0	0.0
CeTGRR_e_TransGr7	0.0	0.0
CeTGRR_e_TransGr8	0.0	0.0

Initial Supporting table - DFCO_EngSpdEnblOfst

Description:

y/x	-1,750	-1,500	-1,250	-1,000	-700	-500	-300	-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	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
2	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
3	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
4	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
5	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
6	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
7	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
8	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
9	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
10	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
11	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
12	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
13	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
14	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
15	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
16	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
17	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0

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	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
2	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
3	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
4	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
5	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
6	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
7	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
8	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
9	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
10	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
11	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
12	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
13	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
14	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
15	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
16	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
17	9.0	9.0	9.0	20.0	22.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0

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	1,000.0	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	79.0	99.0	101.0	101.0	118.0	120.0	130.0	140.0	160.0

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	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0
1,000.0	454.0	449.0	441.0	383.0	327.0	310.0	285.5	277.0	262.5
1,500.0	471.0	468.0	461.0	458.0	452.0	433.5	389.5	362.5	346.5
2,000.0	491.5	484.5	479.5	473.5	467.5	466.0	457.0	439.0	427.0
2,500.0	519.5	511.5	501.0	496.0	486.5	481.0	471.5	463.5	456.0
3,000.0	537.0	525.5	522.0	512.5	503.0	495.0	483.5	470.0	460.0
3,500.0	547.5	535.0	528.0	519.5	512.5	504.5	491.5	478.5	469.5
4,000.0	557.5	545.5	538.0	532.0	526.5	522.5	508.5	497.0	489.5
4,500.0	578.0	564.0	555.0	548.0	542.0	535.0	527.0	511.5	502.5
5,000.0	600.0	584.5	575.5	567.0	556.5	549.5	540.0	523.5	514.0

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	160.0	160.0	160.0	160.0	160.0	160.0	160.0

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	5.0	5.0	5.0	5.0	5.0	5.0	5.0

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	140	140	140	140	140	140	140	140	140
1,500	146	146	146	146	146	146	146	146	146
2,000	150	150	150	150	150	150	150	150	150
2,500	170	170	170	170	170	170	170	170	170
3,000	182	182	182	182	182	182	182	182	182
3,500	186	186	186	186	186	186	186	186	186
4,000	191	191	191	191	191	191	191	191	191
4,500	196	196	196	196	196	196	196	196	196
5,000	200	200	200	200	200	200	200	200	200

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	226	225	224	221	219	215	212	210	205
1,500	236	237	235	232	230	227	221	220	214
2,000	244	243	242	240	234	232	228	227	225
2,500	250	250	247	244	239	238	235	234	230
3,000	264	259	256	254	250	246	243	241	236
3,500	272	268	264	259	258	256	250	249	244
4,000	282	276	273	269	265	263	258	256	250
4,500	293	285	285	280	275	273	268	266	261
5,000	303	295	294	288	281	277	275	273	269

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	68.4	67.4	65.3	48.6	32.6	28.5	22.2	20.3	17.4
1,500.0	70.5	69.5	67.8	67.8	66.8	62.1	50.6	42.9	39.8
2,000.0	74.3	72.6	71.4	70.2	70.1	70.4	68.9	63.6	60.8
2,500.0	80.9	78.6	76.4	75.6	74.4	73.1	71.0	69.0	68.0
3,000.0	82.1	80.1	80.0	77.7	75.9	74.7	72.2	68.9	67.2
3,500.0	82.7	80.3	79.2	78.2	76.5	74.7	72.5	68.9	67.8
4,000.0	82.7	80.9	79.7	79.1	78.5	78.0	75.2	72.3	71.9
4,500.0	85.7	83.7	81.2	80.6	80.3	78.8	77.9	73.8	72.6
5,000.0	89.3	86.9	84.6	83.9	82.8	81.8	79.7	75.2	73.7

Initial Supporting table - Down Stream Stk Temp Vrtn

Description: Minimum temperature movement required to pass the stuck diagnostic.

Value Units: Minimum temperature movement (degC)
X Unit: Downstream Temp sensor temp (degC)

y/x	-40	0	20	40	60	80	100	120
1	5	5	5	5	5	5	5	5

Initial Supporting table - EGR Efficiency Flow Offset

Description: Efficiency offset correction map to be applied to the HPE cooler efficiency calculation.

Value Units: Cooler Efficiency offset (%)
X Unit: Valve Total Flow (g/s)

y/x	1	2	3	4	6
1	0	0	0	0	0

Initial Supporting table - GearDownShftOffset

Description: Offset for Turbine Blade Protection - correction to turbo temperature for recent downshifts that can elevate temp for short period of time

Value Units: Offset for Turbine Blade Protection (degC)
X Unit: Turbo temp (degC)
Y Units: Engine Speed (rpm)

y/x	700	800	850	900	1,000
2,000	50	50	50	50	50
2,500	50	50	50	50	50
3,000	50	50	50	50	50
3,500	50	50	50	50	50
4,000	50	50	50	50	50

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_NonSelectedCell

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_NonSelectedCell

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	1,250	1,500	1,700	1,900	2,100	2,300	2,500	2,800	3,100	3,400	3,800	4,200	4,600	5,000	5,500	6,000
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	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
110	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
140	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
170	9,999.00	150.25	155.00	162.25	171.25	176.25	157.50	163.75	152.25	146.00	129.50	130.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
200	9,999.00	198.00	186.00	144.50	163.75	189.50	165.75	170.00	150.00	134.00	114.50	113.75	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
230	9,999.00	177.75	169.50	152.00	162.75	160.00	149.50	147.00	138.25	126.50	126.50	121.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
260	9,999.00	200.75	185.00	167.75	169.00	170.00	151.50	164.75	148.25	145.25	126.75	119.75	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
290	9,999.00	195.50	197.00	189.00	169.50	184.50	154.25	148.50	151.75	156.00	133.50	126.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
320	9,999.00	182.25	190.50	167.50	162.00	174.25	164.75	165.50	160.50	157.25	144.50	124.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
350	9,999.00	234.00	210.00	210.50	197.00	191.25	178.00	175.25	174.00	160.50	167.00	152.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
380	9,999.00	239.75	171.50	218.00	195.50	196.75	186.25	131.00	173.75	164.25	159.00	158.50	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
410	9,999.00	230.50	221.50	219.75	212.75	236.25	207.50	147.50	174.00	179.25	171.50	157.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
440	9,999.00	221.50	221.50	219.75	212.75	215.25	194.50	197.50	166.25	193.25	196.50	178.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
470	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
500	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
530	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	1,250	1,500	1,700	1,900	2,100	2,300	2,500	2,800	3,100	3,400	3,800	4,200	4,600	5,000	5,500	6,000
50	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
110	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
140	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
170	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
230	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
260	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
290	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
350	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
380	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
410	0.00	0.00	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	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
470	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
500	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
530	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	1,250	1,500	1,700	1,900	2,100	2,300	2,500	2,800	3,100	3,400	3,800	4,200	4,600	5,000	5,500	6,000
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	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
110	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
140	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
170	9,999.00	34.25	26.75	31.75	30.50	30.00	37.75	32.50	34.25	33.25	34.50	32.50	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
200	9,999.00	36.75	37.25	56.25	45.00	40.00	39.75	31.00	37.25	36.50	43.50	39.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
230	9,999.00	40.00	64.00	66.50	48.00	50.75	49.25	40.00	37.00	46.50	48.00	49.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
260	9,999.00	30.75	54.00	56.00	41.50	43.00	56.25	40.25	40.50	34.50	50.50	41.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
290	9,999.00	41.25	43.50	41.50	56.75	46.25	62.25	47.75	40.00	41.50	47.25	43.75	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
320	9,999.00	64.75	68.00	67.00	68.00	53.25	55.75	45.50	37.50	41.50	52.00	45.50	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
350	9,999.00	67.00	66.50	60.50	59.75	66.00	70.00	38.00	48.75	45.75	55.75	51.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
380	9,999.00	83.00	139.00	65.00	69.50	66.25	69.50	89.75	54.75	57.25	64.50	50.00	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
410	9,999.00	96.50	110.00	114.00	93.00	61.75	74.00	78.75	69.75	54.75	62.00	67.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
440	9,999.00	110.00	110.00	114.00	93.00	86.00	110.50	88.75	75.50	67.50	64.00	63.25	9,999.00	9,999.00	9,999.00	9,999.00	9,999.00
470	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
500	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
530	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 -Piston Protection Airflow

Description: Mass of air per cylinder threshold above which piston protection will be enabled if it is currently disabled

Value Units: Air Per Cylinder (mg/cylinder)
X Unit: Engine Speed (rpm)

y/x	1,600	2,400	3,200	4,000	4,800	5,600	6,400	7,200	8,000
1	100	120	140	160	180	200	220	240	260

Initial Supporting table - UP Stream Stk Temp Vrtn

Description: Minimum temperature movement to pass the stuck diagnostic.

Value Units: Minimum temperature movement (degC)
X Unit: Upstream Temp sensor temp (degC)

y/x	-40	0	20	40	60	80	100	120
1	5	5	5	5	5	5	5	5

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	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
12	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
16	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
24	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
12	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
16	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
24	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	3,000	3,500
8	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1
30	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1

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	3,000	3,500
8	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1
30	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1

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	3	4	4	4	4	4	4	4	4

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	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

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	2	2	2	2	2	2	2	2	2

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	550	700	800	900	1,000	1,200	1,400	1,600
2	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
12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	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
60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

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	550	700	800	900	1,000	1,200	1,400	1,600
2	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
12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	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
60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

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	900	1,050	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
2	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
8	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
12	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
16	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
24	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
98	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	900	1,050	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
2	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
8	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
12	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
16	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
24	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
98	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	20.0	20.0	20.0	20.0	18.0	16.0	15.0	14.0
10	20.0	20.0	20.0	20.0	18.0	16.0	14.0	13.0
20	20.0	20.0	20.0	20.0	18.0	16.0	13.0	13.0
30	20.0	20.0	20.0	18.0	16.0	10.0	10.0	9.0
40	19.0	19.0	16.0	14.0	10.0	8.0	8.0	8.0
50	16.0	16.5	11.0	10.0	7.0	6.0	6.0	6.0
60	14.0	14.0	10.0	7.0	5.0	5.0	5.0	5.0
70	10.0	10.0	8.0	5.5	5.0	5.0	5.0	5.0
80	9.0	9.0	7.0	5.0	5.0	5.0	5.0	5.0
90	9.0	9.0	7.0	5.0	5.0	5.0	5.0	5.0
100	9.0	9.0	7.0	5.0	5.0	5.0	5.0	5.0

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
10	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
50	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
10	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
50	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	900	1,050	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
6	1.00	1.00	1.17	1.00	1.00	0.79	0.77	0.89	0.92	1.00	1.07	1.00	0.92	1.00	1.00	0.91	0.80
12	1.00	1.00	1.00	0.60	1.33	0.91	1.30	1.40	1.30	1.30	1.00	1.30	1.00	1.00	1.22	1.00	0.80
16	0.70	0.70	0.53	0.46	1.60	1.09	1.33	1.38	1.71	1.50	1.27	1.20	1.50	1.30	1.25	1.25	0.92
18	0.63	0.63	0.63	0.71	1.30	1.00	1.54	1.38	1.50	1.25	1.25	1.10	1.20	1.10	1.29	1.40	1.15
21	0.53	0.53	0.53	0.40	1.00	0.93	1.33	1.33	1.67	1.08	1.30	1.10	1.20	1.14	1.25	1.35	1.30
25	0.50	0.50	0.42	0.40	1.00	0.70	0.80	1.20	1.47	1.06	1.27	1.25	1.30	1.11	1.19	1.10	1.42
30	0.35	0.35	0.35	0.40	0.73	0.70	0.86	1.17	1.30	1.25	1.13	1.17	1.50	1.08	1.02	1.20	1.50
40	0.40	0.40	0.40	0.56	0.71	0.67	1.14	1.14	1.17	1.52	1.42	1.13	1.25	1.07	1.00	1.09	1.20
60	0.30	0.30	0.30	0.45	0.67	0.57	0.89	1.00	0.86	1.60	1.52	1.35	1.33	1.22	1.33	1.25	1.30

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	900	1,050	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
6	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-1
12	-4	-4	-6	-2	-1	0	-1	-1	0	0	0	0	-1	-1	-1	0	-1
16	-4	-4	-6	-4	-2	-2	-1	-1	-1	-1	-1	-1	0	0	0	0	-1
18	-3	-3	-4	-5	-3	-2	-1	-1	-1	-1	0	0	0	0	0	0	0
21	-3	-3	-4	-5	-3	-2	-1	-1	-1	-1	0	0	0	0	0	0	0
25	-2	-2	-3	-4	-6	-4	-2	-1	-1	-1	0	0	0	0	0	0	0
30	-1	-1	-2	-4	-6	-5	-4	-2	-1	0	0	0	0	0	0	0	0
40	-1	-1	-1	-3	-4	-5	-6	-3	-1	-1	0	0	0	0	0	0	0
60	-1	-1	-1	-3	-4	-5	-5	-3	-2	-2	0	0	0	0	0	0	0

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	550	700	800	900	1,000	1,200	1,400	1,600
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	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
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	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

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	550	700	800	900	1,000	1,200	1,400	1,600
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	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
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	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

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	5	5	5	5	5	5	5	5	5
10	5	5	5	5	5	5	5	5	5
20	5	5	5	5	5	5	5	5	5
30	5	5	5	5	5	5	5	5	5
40	5	5	5	5	5	5	5	5	5
50	5	5	5	5	5	5	5	5	5
60	5	5	5	5	5	5	5	5	5
80	5	5	5	5	5	5	5	5	5
100	5	5	5	5	5	5	5	5	5

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
10	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
50	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	500	600	700	800	900	1,050	1,100	1,199	1,200	1,400	1,600	1,800	2,000
6	800	800	800	800	800	500	550	550	550	300	180	130	80
8	800	800	800	800	800	500	550	500	500	300	190	130	90
10	800	800	800	800	800	500	550	500	500	300	220	130	90
12	800	800	800	800	800	500	550	500	500	300	220	130	100
14	700	700	700	700	800	500	550	500	500	300	220	140	110
16	1,000	1,000	1,000	1,000	700	600	600	600	600	350	230	150	130
18	1,100	1,100	1,100	1,100	750	750	750	600	600	400	250	130	130
20	1,200	1,200	1,200	1,200	800	800	800	600	600	400	270	150	150
22	1,300	1,300	1,300	1,300	800	800	800	600	600	400	300	160	150
24	1,400	1,400	1,400	1,400	800	800	800	600	600	400	350	250	210
26	1,700	1,700	1,700	1,700	800	800	800	600	600	400	400	300	230
30	2,000	2,000	2,000	2,000	800	800	800	600	600	550	450	350	300
30	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	1,400	550	450	350	300
40	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	1,800	650	500	350	350
55	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	2,200	800	600	450	500
72	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	2,600	1,200	800	500	600
95	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	3,000	1,500	900	550	700

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
6	65	40	30	30	24	15	10	11	10	10	10	10	10
8	65	40	30	30	24	15	10	11	10	10	10	10	10
10	70	50	35	30	27	15	10	11	10	10	10	10	10
12	70	55	45	35	31	18	9	10	10	10	10	10	10
14	70	55	50	40	31	20	12	12	11	11	11	11	11
16	70	60	55	50	35	22	15	12	13	13	13	13	13
18	80	80	80	70	50	30	17	12	13	13	13	13	13
20	90	120	90	80	55	35	20	13	12	12	12	12	12
22	120	140	95	80	60	40	25	16	12	12	12	12	12
24	150	160	110	85	70	45	27	18	12	12	12	12	12
26	180	170	120	100	75	50	30	20	13	13	13	13	13

Initial Supporting table - CylModeDecel

30	230	200	160	120	80	60	44	25	15	15	15	15	15
30	230	200	160	120	80	60	44	25	15	15	15	15	15
40	300	230	190	160	120	75	55	32	25	25	25	25	25
55	350	250	230	200	150	90	60	40	32	32	32	32	32
72	400	290	270	240	180	105	70	50	35	35	35	35	35
95	450	340	310	280	210	120	80	60	40	40	40	40	40

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	500	600	700	800	900	1,050	1,100	1,199	1,200	1,400	1,600	1,800	2,000
6	1,200	1,200	1,200	1,200	1,200	750	700	630	630	420	240	170	120
8	1,200	1,200	1,200	1,200	1,200	750	700	600	600	400	240	200	120
10	1,200	1,200	1,200	1,200	1,200	750	700	700	700	500	300	280	160
12	1,200	1,200	1,200	1,200	1,200	800	700	600	600	600	350	300	220
14	1,200	1,200	1,200	1,200	1,200	800	600	700	700	650	380	350	250
16	1,200	1,200	1,200	1,200	1,200	800	700	700	700	700	400	350	280
18	1,200	1,200	1,200	1,200	1,200	1,000	900	800	800	800	500	400	280
20	1,400	1,400	1,400	1,400	1,400	1,200	1,000	900	900	800	600	500	300
22	1,600	1,600	1,600	1,600	1,600	1,400	1,200	1,100	1,100	800	650	500	350
24	1,900	1,900	1,900	1,900	1,900	1,700	1,500	1,200	1,200	800	600	500	400
26	2,300	2,300	2,300	2,300	2,300	2,000	1,700	1,400	1,400	800	600	500	500
30	3,000	3,000	3,000	3,000	3,000	2,400	2,000	1,600	1,600	800	600	500	550
30	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	1,600	800	600	500	550
40	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	2,400	1,200	700	500	600
55	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	3,000	1,200	900	800	800
72	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	3,500	1,400	1,200	1,000	900
95	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	4,000	1,600	1,400	1,200	1,000

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
6	100	80	55	50	35	25	17	15	15	15	15	15	15
8	100	80	55	50	35	25	17	15	15	15	15	15	15
10	130	90	75	60	40	25	17	15	15	15	15	15	15
12	160	120	90	70	55	35	17	15	15	15	15	15	15
14	190	150	110	80	65	40	22	18	15	15	15	15	15
16	230	160	130	90	75	45	30	20	18	18	18	18	18
18	260	200	150	130	100	55	38	22	20	20	20	20	20
20	280	230	180	150	110	65	48	28	22	22	22	22	22
22	300	250	190	160	120	80	52	32	24	24	24	24	24
24	320	280	220	170	140	90	58	35	26	26	26	26	26
26	380	320	240	190	150	100	62	40	30	30	30	30	30

Initial Supporting table - CylModeJerk

30	440	350	300	220	170	110	70	47	34	34	34	34	34
30	440	350	300	220	170	110	70	47	34	34	34	34	34
40	550	500	400	300	240	150	90	60	45	45	45	45	45
55	700	600	500	400	300	200	130	90	70	70	70	70	70
72	800	700	600	500	350	250	150	100	80	80	80	80	80
95	900	800	700	600	400	300	170	110	90	90	90	90	90

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0

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	5,000	5,000	5,000	5,000	5,000	5,000	5,000

EngineOverSpeedLimit - Part 2

y/x	CeTGRR_e_TransGr10	CeTGRR_e_TransGrNeut	CeTGRR_e_TransGrRvrs	CeTGRR_e_TransGrPark	CeTGRR_e_TransGr7	CeTGRR_e_TransGr8	
1	5,000	5,000	5,000	5,000	5,000	5,000	

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	800	1,000	1,300	1,450	1,475	1,500	1,525	1,550	1,575	1,600	1,650	1,800	2,000
2	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
4	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
4	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
5	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
6	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
6	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
7	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
8	5,000	5,000	300	300	300	250	220	220	220	220	220	220	220
9	5,000	5,000	300	300	300	250	300	300	300	300	300	300	300
11	5,000	5,000	300	300	300	300	350	350	350	350	350	350	350
12	5,000	5,000	400	400	400	350	400	400	400	400	400	400	400
14	5,000	5,000	600	600	600	400	450	550	550	550	550	550	550
16	5,000	5,000	600	600	600	500	500	600	600	600	600	600	600
18	5,000	5,000	600	600	600	600	650	600	600	600	600	600	600
21	5,000	5,000	600	600	600	600	650	600	600	600	600	600	600
31	5,000	5,000	600	600	600	600	650	600	600	600	600	600	600
45	5,000	5,000	600	600	600	600	650	600	600	600	600	600	600

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	800	1,000	1,300	1,450	1,475	1,500	1,525	1,550	1,575	1,600	1,650	1,800	2,000
2	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
4	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
4	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
5	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
6	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
6	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
7	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
8	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
9	5,000	5,000	450	450	450	300	300	300	300	300	700	700	700
11	5,000	5,000	450	450	450	350	350	350	350	350	800	800	800
12	5,000	5,000	450	450	450	450	450	450	450	450	1,000	1,000	1,000
14	5,000	5,000	800	800	800	500	500	500	500	500	1,100	1,100	1,100
16	5,000	5,000	800	800	800	600	600	600	600	600	1,100	1,100	1,100
18	5,000	5,000	800	800	800	700	700	700	700	700	1,100	1,100	1,100
21	5,000	5,000	800	800	800	700	700	700	700	700	1,100	1,100	1,100
31	5,000	5,000	800	800	800	700	700	700	700	700	1,100	1,100	1,100
45	5,000	5,000	800	800	800	700	700	700	700	700	1,100	1,100	1,100

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	1,300	1,400	1,600	1,800
2	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
4	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
4	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
5	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
7	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
8	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
9	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
11	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
12	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
14	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
16	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
18	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
21	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
31	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
45	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768

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	1,300	1,400	1,600	1,800
2	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
4	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
4	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
5	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
7	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
8	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
9	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
11	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
12	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
14	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
16	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
18	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
21	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
31	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
45	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768

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 - 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	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

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	-40	-32	-25	-25	-15	0	8	16	20	24	32	40	40	64	80	96	112
1	11.0	11.0	10.0	10.0	8.7	7.0	5.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0

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	-40	-32	-25	-25	-15	0	8	16	20	24	32	40	40	64	80	96	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	-40	-32	-25	-25	-15	0	8	16	20	24	32	40	40	64	80	96	112
0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
13	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
25	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
38	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
50	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
63	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
75	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
88	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
100	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

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	-40	-32	-25	-25	-15	0	8	16	20	24	32	40	40	64	80	96	112
0	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
13	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
25	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
38	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
50	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
63	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
75	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
88	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
100	18.0	17.5	17.3	17.3	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

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	4.00	8.00	12.00	16.00	20.00	24.00	28.00	36.00
1.00	1.15	1.15	1.15	1.15	1.15	1.15	1.15	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	4.00	8.00	12.00	16.00	20.00	24.00	28.00	36.00
1.00	0.79	0.79	0.75	0.75	0.80	0.86	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	500.000	500.000	1,000.000	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	0	0	0	0
CePISR_e_80msSeq	0	0	0	0
CePISR_e_100msSeq	0	0	0	0
CePISR_e_EventA_Seq	0	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	30.00	30.00	30.00	30.00	30.00	30.00

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	125.00	117.30	143.22	167.17	138.41	128.81	115.31	95.13	88.02	89.64	86.08	86.08	86.08	86.08	86.08	86.08
160.00	125.00	125.00	93.73	107.61	123.13	108.56	94.81	85.09	73.30	65.80	63.38	63.28	63.28	63.28	63.28	63.28	63.28
240.00	125.00	125.00	78.09	86.06	96.09	89.31	75.03	67.42	57.30	51.80	49.09	50.03	50.03	50.03	50.03	50.03	50.03
320.00	125.00	125.00	66.95	71.59	77.39	74.36	62.03	55.17	46.22	42.48	40.05	41.38	41.38	41.38	41.38	41.38	41.38
400.00	125.00	125.00	57.38	60.64	64.69	61.73	51.78	45.83	38.66	35.33	33.25	34.31	34.31	34.31	34.31	34.31	34.31
480.00	125.00	125.00	48.94	51.88	55.47	52.50	43.72	39.14	33.20	30.14	28.33	29.16	29.16	29.16	29.16	29.16	29.16
560.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
640.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
720.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
800.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
880.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
960.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,040.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,120.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,200.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,280.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52
1,360.00	125.00	125.00	44.58	47.30	50.33	47.75	39.61	35.69	30.31	27.44	25.80	26.52	26.52	26.52	26.52	26.52	26.52

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	-30.00	-20.00	-10.00	0.00	50.00	90.00
500.00	250.00	250.00	250.00	250.00	250.00	250.00
600.00	250.00	250.00	250.00	250.00	189.66	190.13
700.00	250.00	250.00	250.00	250.00	147.94	147.93
800.00	227.84	220.86	250.00	241.38	119.06	118.72
900.00	211.36	204.38	250.00	222.58	107.71	107.24
1,000.00	193.05	186.07	228.26	197.88	91.40	90.14
1,100.00	181.30	173.49	209.45	178.35	74.93	73.57
1,200.00	160.71	150.65	178.43	150.73	50.80	48.86
1,300.00	146.48	134.96	160.05	149.12	50.20	47.96
1,550.00	128.72	117.03	139.92	143.42	47.86	45.04
1,800.00	94.31	85.42	100.93	110.72	30.60	27.96
2,050.00	69.53	61.03	71.18	75.99	17.22	15.40
2,550.00	52.89	46.48	57.01	62.59	8.34	7.35
3,050.00	37.31	31.25	42.24	48.72	-4.46	-4.46
4,050.00	34.17	28.09	39.07	45.56	-7.75	-7.75
6,050.00	25.74	19.61	30.59	37.08	-16.50	-16.50
6,400.00	24.13	18.00	28.98	35.47	-18.11	-18.11

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	4	8	12	16	20	24	28	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	4	8	12	16	20	24	28	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	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	7.6563
6.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	7.6563
7.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	7.6563
9.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	7.6563
10.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	7.6563
12.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
13.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
15.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
16.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
18.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
19.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
21.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
22.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
24.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
25.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
27.0000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875
28.5000	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875	10.1875

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	550	700	800	900	1,000	1,200	1,400	1,600
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	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
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	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

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	550	700	800	900	1,000	1,200	1,400	1,600
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	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
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	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

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	900	1,050	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
6	0.83	0.83	0.75	0.70	0.67	0.67	0.62	0.67	0.69	0.80	1.00	0.83	0.83	0.67	0.80	0.91	1.10
12	1.00	1.00	0.83	0.70	0.67	0.60	0.69	0.70	0.90	0.91	0.78	0.80	0.65	0.72	1.00	1.00	1.10
16	1.00	1.00	0.80	0.62	0.86	0.65	0.80	0.75	1.10	1.00	0.73	0.70	0.60	0.82	0.80	0.83	0.85
18	1.00	1.00	0.88	0.60	0.80	0.80	1.00	0.88	1.00	0.88	0.70	0.60	0.60	0.67	0.82	0.83	0.69
21	1.20	1.20	1.00	0.63	0.90	0.85	1.10	0.90	1.00	0.67	0.67	0.65	0.73	0.71	0.80	0.92	0.75
25	1.10	1.10	1.00	0.88	1.20	0.90	0.80	0.75	0.80	0.60	0.75	0.71	0.79	0.78	0.90	0.83	0.83
30	0.80	0.80	0.70	0.64	1.40	1.00	0.86	0.83	0.78	0.70	0.69	0.83	0.94	0.83	0.73	0.72	0.80
40	0.83	0.83	0.70	1.00	1.57	1.00	1.25	0.86	0.83	0.78	0.84	0.81	0.83	0.93	0.82	0.84	0.72
60	0.70	0.70	0.70	0.82	1.44	0.86	1.10	0.60	0.71	0.80	0.78	0.80	0.93	0.89	0.83	0.88	0.90

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	900	1,050	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
6	1.00	1.00	1.13	1.15	1.00	0.96	0.95	0.92	0.80	0.80	1.00	0.90	1.00	0.92	1.00	1.13	1.33
12	1.30	1.30	1.30	1.15	0.75	0.80	0.70	0.65	0.80	0.75	0.75	0.75	0.75	0.90	1.00	1.10	1.33
16	2.00	2.00	1.80	1.14	0.86	0.75	0.70	0.61	0.70	0.75	0.67	0.62	0.60	0.67	0.60	0.85	1.10
18	2.00	2.00	1.78	1.20	0.80	0.80	0.70	0.71	0.65	0.75	0.70	0.65	0.60	0.70	0.66	0.82	1.00
21	2.00	2.00	2.00	1.30	1.00	0.80	0.72	0.80	0.60	0.72	0.74	0.70	0.83	0.80	0.80	0.78	0.85
25	1.75	1.75	1.80	1.40	1.40	1.20	1.00	0.75	0.69	0.70	0.82	0.70	0.86	0.85	0.86	0.75	0.85
30	1.33	1.33	1.50	1.56	1.80	1.83	1.40	0.95	0.80	0.71	0.83	0.90	0.95	1.00	1.00	0.75	0.88
40	1.25	1.25	1.30	1.58	1.83	2.00	1.80	1.17	0.91	0.76	0.88	0.90	0.96	1.00	1.11	0.92	1.00
60	1.25	1.25	1.30	1.40	2.20	1.56	1.38	0.85	0.71	0.67	0.80	0.80	0.95	0.80	0.85	0.85	0.86

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	550	700	800	900	1,000	1,200	1,400	1,600
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	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
17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
45	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

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	550	700	800	900	1,000	1,200	1,400	1,600
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	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
17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
45	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

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
10	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
50	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	800	1,000	1,200	1,600	2,000	2,400	2,600	3,000	3,500
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
10	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
30	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
50	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
60	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
100	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	900	1,050	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
6	1.10	1.40	1.20	1.20	1.30	1.30	1.31	1.40	1.70	1.90	1.80	1.70	1.46	1.60	1.60	1.10	1.00
9	1.30	1.60	1.30	1.50	1.10	1.10	1.50	1.30	1.70	1.90	2.00	1.70	1.50	1.60	1.60	1.10	1.00
12	1.70	2.00	1.80	2.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	1.90	1.80	1.90	1.80	1.20	1.00
14	2.20	2.20	2.00	2.10	1.00	1.00	2.30	2.20	2.30	2.20	2.00	2.00	2.00	2.00	1.80	1.50	1.10
17	1.90	2.20	2.10	2.10	1.05	1.05	2.50	2.40	2.50	2.40	2.00	1.90	2.00	2.00	2.00	1.70	1.20
21	1.80	2.10	2.00	1.90	1.10	1.10	2.50	2.50	2.50	2.00	2.00	1.90	2.00	2.00	2.00	1.90	1.60
27	1.50	1.50	1.50	1.80	1.20	1.20	2.30	1.90	2.00	1.80	1.90	1.90	2.00	1.90	1.80	2.00	1.90
45	1.40	1.40	1.40	1.80	1.35	1.35	2.00	2.00	2.00	2.00	2.00	1.90	2.00	2.00	1.70	2.00	2.00
60	1.30	1.30	1.30	1.80	1.50	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.10	2.20	2.20

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	900	1,050	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
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
9	1.00	1.00	1.10	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.20	1.20	1.50	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14	1.40	1.40	1.50	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
17	1.50	1.50	1.50	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
21	1.50	1.50	1.50	1.30	1.10	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
27	1.20	1.20	1.20	1.20	1.30	1.30	1.20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
45	1.00	1.00	1.10	1.10	1.40	1.50	1.50	1.00	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	1.00	1.00	1.00	1.00	1.00	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
9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	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
17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
45	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

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	600	800	1,400	2,200	3,000	4,000	5,000	6,000	7,000
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

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
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
8	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
10	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
12	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
14	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
16	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
18	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
20	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
22	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
24	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
26	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
30	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
30	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
40	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
55	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
72	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
95	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768

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	5	5	4	4	3	3	3	3	3

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	1,300	1,400	1,600	1,800
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
8	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
10	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
12	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
14	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
16	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
18	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
20	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
22	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
24	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
26	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
30	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
30	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
40	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
55	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
72	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
95	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768

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	1,300	1,400	1,600	1,800
6	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
8	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
10	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
12	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
14	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
16	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
18	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
20	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
22	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
24	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
26	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
30	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
30	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
40	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
55	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
72	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768
95	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768	32,768

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	600	800	1,400	2,200	3,000	4,000	5,000	6,000	7,000
0	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
2	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
3	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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	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	20.0	20.0
200	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	20.0	20.0
300	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	20.0	20.0
400	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	20.0	20.0
500	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	20.0	20.0
600	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	20.0	20.0
700	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	20.0	20.0
800	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	20.0	20.0
900	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	20.0	20.0
1,000	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	20.0	20.0
1,100	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	20.0	20.0
1,200	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	20.0	20.0
1,300	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	20.0	20.0
1,400	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	20.0	20.0

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	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002	1.40002

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	500	600	700	800	900	1,050	1,100	1,199	1,200	1,400	1,600	1,800	2,000
65	-3.80	-3.80	-3.80	-3.80	-3.65	-3.45	-3.30	-1.30	-1.30	-1.00	-1.15	-1.20	-1.30
75	-3.40	-3.40	-3.40	-3.40	-3.25	-3.05	-2.90	-0.90	-0.90	-0.60	-0.75	-0.80	-0.90
85	-3.10	-3.10	-3.10	-3.10	-2.95	-2.75	-2.60	-0.60	-0.60	-0.30	-0.45	-0.50	-0.60
95	-2.80	-2.80	-2.80	-2.80	-2.65	-2.45	-2.30	-0.30	-0.30	0.00	-0.15	-0.20	-0.30
105	-2.50	-2.50	-2.50	-2.50	-2.35	-2.15	-2.00	0.00	0.00	0.30	0.15	0.10	0.00

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	-1.30	-1.30	-2.10	-2.50	-2.60	-2.60	0.98	3.49	5.98	8.48	10.98	13.48	18.48
75	-0.90	-0.90	-1.70	-2.10	-2.20	-2.20	1.39	3.88	6.38	8.88	11.38	13.89	18.88
85	-0.60	-0.60	-1.40	-1.80	-1.90	-1.90	1.68	4.18	6.68	9.19	11.68	14.18	19.18
95	-0.30	-0.30	-1.10	-1.50	-1.60	-1.60	1.98	4.48	6.98	9.48	11.98	14.48	19.48
105	0.00	0.00	-0.80	-1.20	-1.30	-1.30	2.28	4.79	7.28	9.78	12.28	14.78	19.78

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	500	600	700	800	900	1,050	1,100	1,199	1,200	1,400	1,600	1,800	2,000
65	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00
75	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00
85	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00
95	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00
105	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00

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	-2.00	-2.00	-2.00	-2.00	-2.00	-0.24	1.50	3.25	5.00	6.76	8.50	10.25	12.01
75	-2.00	-2.00	-2.00	-2.00	-2.00	-0.24	1.50	3.25	5.00	6.76	8.50	10.25	12.01
85	-2.00	-2.00	-2.00	-2.00	-2.00	-0.15	1.60	3.35	5.10	6.85	8.60	10.35	12.10
95	-2.00	-2.00	-2.00	-2.00	-2.00	-0.05	1.70	3.45	5.20	6.95	8.70	10.45	12.20
105	-2.00	-2.00	-2.00	-2.00	-2.00	0.25	2.00	3.75	5.50	7.25	9.00	10.75	12.50

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	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88

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	700	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	47.8379	47.8516	45.0566	36.7969	37.0527	32.8027	28.2910	24.5977	19.0352	21.6113	22.3848	17.9355	17.9375	17.9375	17.9375	17.9375	17.9375

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	700	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	0.3867	0.1816	0.3652	0.3027	0.2070	0.2148	0.1758	0.1172	0.1270	0.1074	0.0957	0.1113	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	700	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	23.7207	23.6660	22.1855	18.1328	18.1426	16.0898	13.9199	12.0957	9.2910	10.6133	11.1582	9.1211	9.1211	9.1211	9.1211	9.1211	9.1211

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	700	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	0.2480	0.1113	0.2109	0.1914	0.1094	0.0996	0.0762	0.0508	0.0566	0.0449	0.0371	0.0371	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	0	0	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	0.600	0.600	0.735	0.570	0.480	0.400	0.330	0.311	0.290	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270

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	700	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	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500

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	700	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Bundle Name: 5VoltReferenceA_FA
P0641
Bundle Name: 5VoltReferenceB_FA
P0651
Bundle Name: 5VoltReferenceMAP_OOR_Flt
P0697
Bundle Name: A/F Imbalance Bank1
P219A
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: 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 < 300.00 degC
AND
Engine Coolant > -10.00 degC
AND
Engine Coolant <= 40.00 degC
AND
Barometric Pressure>= 70.00 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 >= 700.00 degC
AND
Engine Run Time >= 25.00 seconds

OR

Barometric Pressure < 70.00 KPa

Bundle Name: ClutchPstnSnsr FA
P0806, P0807, P0808
Bundle Name: CommBusAOff_VICM_FA
U0073
Bundle Name: CommBusBOff_VICM_FA
U0074
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: ELCP_PumpCircuit_FA
P2400, P2401, P2402
Bundle Name: ELCP_SwitchCircuit_FA
P2418, P2419, P2420
Bundle Name: ELCPCircuit_FA
P24BA, P24BB
Bundle Name: EngineMetalOvertempActive
P1258
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: FTP_SensorCircuit_FA
P0452, P0453
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: 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: LostCommBCM_FA
U0140
Bundle Name: LostCommBusB_VICM_FA
U182D
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: ModuleOffTime_FA
P262B
Bundle Name: ModuleOffTimeErr
P262B
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_EstAmbTemp_FA
ELCP sealed/vented fuel system, P0071, P0072, P0073, P0502, P0503, P0722, P0723 OR Conventional fuel system, P0071, P0072, P0073, P0074, P2610
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_ECT_Sensor_Ckt_FA
P0116, P0117, P0118, P0119, P111E
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: VICM_WakeupDiag_FA
P06E4
Bundle Name: VICM_WakeupDiag_TFTKO
P06E4
Bundle Name: WRAF_Bank_1_FA
P0131, P0132, P064D, P223C, P223E
Bundle Name: WRAF_Bank_2_FA
P0151, P0152, P064E, P223D, P223F

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 (from the ECM's replicated crank signal) during a period of time; if crank sensor pulses are received, the diagnostic will pass.	No crankshaft pulses received.	Crank Sync State= No Activity for >= 1.40 s	HWIO based crank decode status	= NOT Disable-Crank	Continuous at 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.
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.	Time in which 15.00 crank re-synchronizations occur	Crank Sync State transitions to Activity Detected X times in < 10.00 seconds (without seeing "crank in sync")	HWIO based crank decode status	= NOT Disable-Crank	Continuous every 250 msec	Type B, 2 Trips
			No crankshaft synchronization gap found	Crank Sync State = Activity Detected for >= 1.40 s	HWIO based crank decode status	= NOT Disable-Crank	Continuous every 12.5 msec	

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 DTC sets when the idle speed is lower than the targeted idle speed	Idle Speed	Fail Criteria: Filtered input speed error (desired - actual), is greater than the fail threshold of 91 RPM. Filter coefficient for engine speed = 0.003	No Active DTCs:	Motor A speed faults: P0A3F, P1B03, P0A40, P0C52, P0C53, P0C5C, P0C5D	1 loop execution at 100 ms rate	Type B, 2 Trips
					No Active DTCs:	Motor B speed faults: P0A45, P1B04, P0A46, P0C57, P0C58, P0C61, P0C62		
					No Active DTCs:	Vehicle Speed/TOS sensor faults: P0722, P077B, P215C		
					Accelerator pedal position	Not Defaulted & <= 1.00 %		
					Engine State	Running (not starting or stopping states)		
					Vehicle Speed	<= 2 kph		
					Engine Coolant	>= 60.00 Deg C		
					Commanded RPM Delta	< 50 RPM		
					Idle Conditons Present	>= 10.00 seconds		
				Pass Criteria: Filtered input speed error (desired - actual), is less than fail threshold 81 . Filter coefficient for engine speed = 0.003			Pass condition met for 10.00 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 DTC sets when the idle speed is higher than the targeted idle speed	Idle Speed	Fail Criteria: Filtered input speed error (desired - actual), is less than the fail threshold of -182 RPM. Filter coefficient for engine speed = 0.003	No Active DTCs:	Motor A speed faults: P0A3F, P1B03, P0A40, P0C52, P0C53, P0C5C, P0C5D	1 loop execution at 100 ms rate	Type B, 2 Trips
					No Active DTCs:	Motor B speed faults: P0A45, P1B04, P0A46, P0C57, P0C58, P0C61, P0C62		
					No Active DTCs:	Vehicle Speed/TOS sensor faults: P0722, P077B, P215C		
					Accelerator pedal position	Not Defaulted & <= 1.00 %		
					Engine State	Running (not starting or stopping states)		
					Vehicle Speed	<= 2 kph		
					Engine Coolant	>= 60.00 Deg C		
					Commanded RPM Delta	< 25 RPM		
					Idle Conditons Present	>= 10.00 seconds		
				Pass Criteria: Filtered input speed error (desired - actual), is greater than fail threshold -172 . Filter coefficient for engine speed = 0.003			Pass condition met for 10.00 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
System Voltage Performance	P0561	This diagnostic detects a difference in voltage between the 12V input and the Ignition Run/ Crank Voltage. The fault sets when the host controller detects the difference is above the indicated threshold for the indicated time.	Difference between 12V Battery Voltage Input and Ignition Run/Crank Voltage	> 3.00 Volts	Enable Calibration is True Diagnostic System Code Clear Requested Diagnostic System Reset Complete Battery input is present Ignition Run/Crank Voltage 12V Starter Engaged	= 1.00 (1 is Enabled) = False = True = 1.00 (1 is Available) > 6.0 Volts = False	4 seconds out of a 5 seconds window	Type C, No SVS

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.	Ignition Voltage	≤ 10.00 Volts	Enable Calibration is True 12V Starter Engaged Ignition Run/Crank Voltage Engine Speed	= 1.00 (1 is Enabled) = False > 6.0 Volts ≥ 0.00 RPM	5 seconds out of a 6 seconds window	Type C, No SVS

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	≥ 16.00 Volts	Enable Calibration is True Ignition Run/Crank Voltage	= 1.00 (1 is Enabled) > 6.0 Volts	5 seconds out of a 6 seconds window	Type C, No SVS

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 THCP 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.	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 = False = True	1 failure if it occurs during the first ROM test of the ignition cycle otherwise 5 failures	Type A, 1 Trips
			2nd Processor State of Health ROM fault latched	= TRUE	Controller Status ROM Checksum in Progress (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On ≠ True = False = True	Runs continuously in the background	
			Calculated Checksum of Torque Security Related Calibrations	≠ Expected Checksum	Controller Status (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) = Disable Calibration is False = Enable Calibration is True	= On = False = True = 0 (0 is Enabled) = 1 (1 is Enabled)	1 failure if it occurs during the first ROM test of the ignition cycle otherwise 2 failures	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			ECC Fault detected in Flash memory	= TRUE	Controller Status Power Up Reset AND HWIO BINVDM ECC State AND HWIO ROM Fault Enable Calibration is true	= On = False = False = True = 1 (1 is Enabled)	Greater than 5 failures at controller initialization Runs once at initialization	
			ROM fault Active AND 2nd SOH ROM Fault Latched AND Main SOH ROM Fault Latched	≠ True ≠ True ≠ True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs in the Background	

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 THCP 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 the diagnostic checks that particular calibration and it has a nonzero value.	No Start Calibration is True	= 0 (1 is for No Start Condition)	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at controller initialization and every 1 second there after	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	This Diagnostic tests the NonVolatile Memory (NVM) in the THCP 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.	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 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 out of 5 controller initializations for Failure	
			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	
			Static NVM Error Dynamic NVM Error BINVDM ECC Error	= False = False = False	Enable Calibration is True	= 1 (1 is Enabled)	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 THCP 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 DualStore Error	> 25 ms	Executes in Background loop	Type A, 1 Trips
			HWIO detects an illegal write to Write Protected RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop 1 count to fail	
			2nd Processor State of Health RAM Fault Latched	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop every 1000ms	
			Checksum of PreservedNVM_Region for Main Processor State of Health and 2nd Processor State Of Health	≠ Expected checksum value	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization	
			HWIO detects fault in System RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	
			HWIO detects fault in Cache RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 3 count to fail	
			HWIO detects fault in eTPU RAM (Timer Processing Unit)	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 3 count to fail	
			Main SOH RAM Fault Latched AND SPI Fault Latched	= 0 = False	(Diagnostic System Code Clear Requested AND Diagnostic System Reset	= False = True	Executes in Background loop every 1000ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND System RAM Fault Count AND Cache RAM Fault Count AND eTPU RAM Fault Count	 = 0 = 0 = 0	Complete) Time Since Last Duel Store Error	 > 1,000 ms		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Performance	P0606	This Diagnostic tests all the internal processor subsystems for faults which suggest that the integrity of the processor can not be trusted. Fail Case 1: In case of many faults the THCP microprocessor along with the other 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 2, 3, 4, 5, 6:	Inhibit Path Test Failed Indicates that the Processor is not demonstrating the ability to inhibit the system (take remedial action) during the Inhibit Path Test "2ndFailsToTakeRmdlActn"	>= 3 Failures	HV Batt contactor Staus Available Invertor State HV Batt Voltage HV Contactors 12V Batt Voltage Vehicle Speed Motor Faults Motor Speed SRAR Shutdowns SPI Fault RunCrank Active Ram or ROM fault Seed received in wrong order fault Seed/Key Timeout Powermode Off time	= TRUE = Off >= 80.00 V = Closed > 9.50 V < 0.00 kph = FALSE (None active) <= 20.00 rpm = FALSE = FALSE (No active P0606) = FALSE = FALSE (No active P0601, P0604) = FALSE (No active P0606) = FALSE < 5.00 s	Executes in a 12.5ms loop Detects in 3 key cycles	Type A, 1 Trips
			Key Value Indicates that the Processor received incorrect key values for the associated seed values that it sent out to the secondary processor	≠ expected key value	Number Of Main Processors to monitor IPT status SPI Fault	> 0 = Not Running = FALSE (No active P0606)	Executes in a 12.5ms loop Detects in 150ms or two consecutive faulty keys	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The microprocessors in the TPIM 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. 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 7, 8, 9: These diagnostics are built into the hardware of the THCP microprocessor by the chip manufacturer. These diagnostics	"2ndRxIncorrectKeys"		Run/Crank Voltage	>= 9.50 V		
			New Seed Update Time Indicates that the Processor did not receive a key value from the secondary processor during the expected time frame "MainDtctdSdKeyTimeout"	> 1.00 sec	Number Of Mains 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 >= 9.50 V > 11 V	Executes in a 12.5ms loop Detects in 1 second	
			Seed sequence Indicates that the Processor received key values in the incorrect order from the secondary processor "MainDtctdSdRxWrongOrdr"	≠ expected order	Number Of Mains Processors to monitor AND SPI Faults AND Run/Crank Voltage OR 12V Battery Voltage	> 0 = FALSE (No active P0606) >= 9.50 V > 11 V	0.15 seconds out of a 0.2 seconds window Executes in a 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"	> 0.20 ms	Program Sequence Watch Enabled (KaPISD_b_ProgSeqWatchEnbl[x])	= TRUE	Executes in a 50ms loop after controller initialization	
			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])	= TRUE	0.15 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		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 10: This diagnostic checks the analog to digital converter (ADC) in the THCP 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 11, 12: 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	HWIO detects Fault in ALU Test Indicates that the Processor detected an ALU fault in the processor "MainALU_Flt"	= 2 faults in a key cycle	Enabled Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) AND Run Crank Ingnition Low Voltage AND Run Crank Low Voltage Crank	= 1 (1 is Enabled) = False = True = False = False	Runs continuously in 12.5ms loop	
			HWIO detects Fault in Configuration Registry Test Indicates that the Processor detected a Configuration Register fault in the processor "MainCfgRegFlt"	= 2 faults in a key cycle	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) AND Run Crank Ingnition Low Voltage AND Run Crank Low Voltage Crank	= 1 (1 is Enabled) = False = True = False = False	Runs continuously in 12.5ms loop	
			HWIO detects Fault in the Stack Limit Test Indicates that the CPU Stack memory exceeded the limit "MainStackFlt"	= 2 faults since power up	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False = True	Runs Continuously in 100ms loop	
			Voltage difference between expected circuit voltage and actual test circuit voltage Indicates that the	> 9 V	Enable Calibration is True AND Run/Crank Voltage (Diagnostic System Code Clear Requested	= 1 (1 is Enabled) >= 7 V = False	0.15 seconds out of a 0.2 seconds window OR A2D Converter Test Error >=	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the DTC if there are the indicated number of failures in each diagnostic. Fail Case 13: 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.	Processor detected a problem with the Analog to Digital convertor test circuit "MainADC_Flt"		AND Diagnostic System Reset Complete)	= True	0.20 seconds	
			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 reset 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle)	
			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 reset 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle)	
			HWIO detects Fault in Transfer Test from Flash to RAM OR HWIO detects Fault in the Memory Data From Flash Indicates that the	= TRUE = TRUE	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False = True	50ms Execution Rate after controller initialization	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Processor detected a problem in the data transfer from Flash memory to RAM memory "DMA_XferTest"					
			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	Executes at the end of every trip	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Torque Performance	P061A	This Diagnostic tests if the regenerative braking function is producing too much torque. Potential failures can include memory, software, processor and ALU faults. If the total output torque, including regenerative torque, is greater than the regenerative braking request plus the maximum output torque allowed or the output torque is greater than the regenerative braking request plus the actual output torque request plus the indicated threshold then the DTC is set.	Calculated Output Torque (To)	> Upper limit of Output Torque (ToMax) plus Regen Torque Request OR > Regen Torque Request plus Output Torque Request plus 363.00 Nm threshold	Ignition Run Crank Security Voltage OR Ignition Run/Crank Voltage AND Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	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 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 primary calculated output torque value is compared to the secondary calculated output torque and if that difference is greater than the indicated threshold for the indicated time the fault is set. The DTC is also set if the regenerative braking minus the indicated calibration is greater than the indicated threshold for greater 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 greater than the driver's calculated torque request plus the indicated calibration.	Difference between Immediate Axle Torque command primary and secondary OR Regen Brake Torque Output command minus 0.00 Nm	> 363.00 Nm >= 342.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	Type A, 1 Trips
			Calculated Output Torque (To)	> Max of Drivers Output Torque Request plus 363.00 Nm OR 363.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	
			Calculated Output Torque (To)	< Min of Drivers Output Torque Request minus 363.00 Nm OR - 363.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	
			[Trans Range State AND Output Torque Command AND Shaped Torque for Sign Diff test] OR [Trans Range State AND Output Torque Command AND Shaped Torque for Sign Diff test]	= Drive <= -363.00 Nm >= 0Nm = Reverse >= 363.00 Nm <= 0Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Transient Torque Condition AND (Computed TOS OR ((Computed TOS AND Vehicle Direction Error) OR Vehicle speed rationality)) Enable Calibration is True	>= 9.50 V >= 11.00 V = FALSE <= 236.00 rpm > 135.00 rpm = TRUE = TRUE = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The DTC is set if the fault is present for longer than the indicated time. Fail Case 3: 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 4: This diagnostic tests the calculation of output torque request. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated output torque request is less than the indicated threshold and the transmission is in Drive. The fault is also set if the calculated output torque request is	Motor A torque command	> ShortTerm motor A capacity plus 126.00 Nm OR < ShortTerm motor A capacity minus 126.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	
			Motor B torque command	> ShortTerm motor B capacity plus 118.00 Nm OR < ShortTerm motor B capacity minus 118.00 Nm	Run/Crank Voltage OR Ignition Run/Crank Voltage Enable Calibration is True	>= 9.50 V >= 11.00 V = 0 (0 is Enabled)	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		greater than the indicated threshold and the transmission is in Reverse. The DTC is set if the fault is present for longer than the indicated time. Fail Case 5: 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. Fail Case 6: This diagnostic tests the calculation of motor B torque request. Potential failures can include memory, software, processor and ALU faults. The fault is set if the						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		calculated motor B torque request is greater than the short term motor B capacity plus the indicated threshold. The fault is also set if the calculated motor B torque is less than the motor B capacity minus the indicated threshold. The DTC is set if either fault is present for longer than the indicated time.						

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	Runs once at controller initialization	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HSD1 Actuator Supply Circuit Voltage Low	P0658	This diagnostic reports when a high side driver 1 circuit low fault is detected by the current supply driver and is reported via HWIO.	HWIO circuitry detects if an electrical circuit low is present or not. HSD 1 Short to Ground Fault Status	 =TRUE	Enable Calibration is True HSD 1	= 1 (1 is Enabled) = On	0.13125 seconds out of a 0.15625 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HSD1 Actuator Supply Circuit Voltage High	P0659	This diagnostic reports when a high side driver 1 circuit high fault is detected by the current supply driver and is reported via HWIO.	HWIO circuitry detects if an electrical circuit high is present or not. HSD 1 Short to Power Fault Status	=TRUE	Enable Calibration is True	= 1 (1 is Enabled)	0.00625 seconds (1 Loop)	Type A, 1 Trips

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 THCP 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 THCP. When the ECM does not have correct interaction between its two microprocessors then an incorrect pattern is sent to the THCP and the THCP sets the DTC.	Received pattern from the ECM OR Received malfunction pattern	≠ expected pattern (F, 5, B, D, A, 6, 3, 0) >= 2 counts	Run/Crank Voltage OR Ignition Run/Crank Voltage Run Crank Active Time	>= 9.50 V >= 11.00 V >= 0.10 seconds	0.1 seconds out of a 0.15 seconds window	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 C Circuit Low	P06E7	This diagnostic monitors the IGBT power supply circuit voltage. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Scaled 15V IGBT Supply Voltage	< 12.00 V	Wakeup Signal	ON	0.32 seconds out of a 0.4 seconds window (x of y) OR Continuous Fail Time > 0.30 seconds	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 C Circuit High	P06E8	This diagnostic monitors the IGBT power supply circuit voltage. The sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Scaled 15V IGBT Supply Voltage	> 22.00 V	Wakeup SIgnal	ON	0.32 seconds out of a 0.4 seconds window (x of y) OR Continuous Fail Time > 0.30 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature (TFT) Sensor Performance	P0711	Monitors the performance of Transmission Fluid Temperature (TFT) circuit by comparing the temperature calculated from the resistance vs temp table to an estimated cold soak average temperature or verifying that the temperature calculated from the resistance vs temp table has not latched at a value after a period of time.	Transmission Fluid Temperature Sensor compared to a Cold Soak Average Temperature	≥ (See supporting tables for failure threshold value) **Cold Soak Rationality**	Rationality Enable Calibration is True Time after init controller Cold Soak Enable Calibration is True Cold Soak Average Temperature Message Cold Soak Average Temperature P0712, P0713, U179A, U0293 TFT temperature	= 1 (1 is Enabled) ≥ 3.00 seconds = 1 (1 is Enabled) = Use Data ≥ -40.00 C NOT Fault Active -40.00 ≤ X ≤ 130.00 C	One diagnostic loop once all enable criteria have been met	Type A, 1 Trips
			Continuous Check for Transmission Fluid Temperature Stuck in Range Transmission Oil Temperature Raw - Previous Transmission Oil Temperature	 ≤ 0.00 C	Rationality Enable Calibration is True Time after init controller Continuous Rationality Enable Calibration is True Engine Speed Vehicle Speed Transmission Oil Temperature Raw	= 1 (1 is Enabled) ≥ 3.00 seconds = 1 (1 is Enabled) 0.00 ≤ X ≤ 7,500.00 RPM for 5.00 seconds ≤ 124.27 MPH for 5.00 seconds -40.00 ≤ X ≤ 130.00 C	≥ 300.00 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature (TFT) Sensor Circuit Low Voltage	P0712	Monitors the Transmission Fluid Temperature (TFT) sensor circuit resistance and reports a low voltage condition if the sensed resistance is below a threshold.	Transmission Fluid Temperature (TFT) circuit resistance	≤ 68.60 ohms (Corresponds to 149 C which is above the operating range of the transmission)	Enable Calibration is True 12V Battery Voltage Ignition Run/Crank Voltage	= 1 (1 is Enabled) > 9.00 for 0.10 seconds > 9.00 for 0.10 seconds	2 seconds out of a 3 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature (TFT) Sensor Circuit High Voltage	P0713	Monitors the Transmission Fluid Temperature (TFT) sensor circuit resistance and reports a high voltage condition if the sensed resistance is above a threshold.	Transmission Fluid Temperature (TFT) circuit resistance	≥ 83,641.00 ohms (Corresponds to a temperature below -50 C, which is below the operating range of the transmission)	Enable Calibration is True 12V Battery Voltage Ignition Run/Crank Voltage	= 1 (1 is Enabled) > 9.00 for 0.10 seconds > 9.00 for 0.10 seconds	2 seconds out of a 3 seconds window	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 (TOS) Sensor Wrong Direction	P0721	The DTC monitors when the TOS direction converted from the TOS sensor output pulse amplitude does not fall within the valid ranges for "Forward" or "Reverse" for a calibrated period of time.	TOS Raw Direction	TOS Direction Raw is not Forward or Reverse	Enable Calibration is True TOS Sample Period TOS Sensor Type	= 1 (1 is Enabled) ≠ 0 = CeTOSR_e_Directional	2.5 seconds out of a 3.125 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Output Speed Sensor Circuit - Direction Error	P077B	The DTC monitors when the TOS direction converted rom the TOS sensor output pulse amplitude does not match the TOS direction calculated from the motor A and motor B resolver directions for a calibrated period of time.	Transmission Output Speed Direction Raw	≠ transmission output speed direction calculated from motor A and motor B resolver directions	Enable Calibration is True P0721, P077C, P077D, P215C Hybrid Motor Speed based Estimated Output Speed is Valid Transmission Output Speed and Motor Output Speed Difference Motor Estimated Transmission Output Speed	= 1 (1 is Enabled) NOT Fault Active Calculated based on Stable Speed Equation ≤ 50.00 RPM ≥ 50.00 RPM	0.35 seconds out of a 5 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Output Speed Sensor Circuit Low	P077C	This DTC monitors the transmission output speed sensor signal and reports when the signal voltage is below a calibrated threshold.	Transmission Output Speed Sensor Voltage	< 0.36 Volts	Enable Calibration is True P077D Ignition Run/Crank Voltage 12V Battery Voltage	= 1 (1 is Enabled) NOT Fault Active ≥ 9.00 Volts for 0.00 seconds 9.00 ≤ X ≤ 32.00 V for 0.00 seconds	≥ 0.01 seconds for 36.00 counts at 25 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Output Speed Sensor Circuit High	P077D	This DTC monitors the transmission output speed sensor signal and reports when the signal voltage is above a calibrated threshold.	Transmission Output Speed Sensor Voltage	> 4.25 Volts	Enable Calibration is True P077C Ignition Run/Crank Voltage 12V Battery Voltage	= 1 (1 is Enabled) NOT Fault Active ≥ 9.00 Volts for 0.00 seconds 9.00 ≤ X ≤ 32.00 Volt for 0.00 seconds	≥ 0.01 seconds for 36.00 counts at 25 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch 1 Slip	P079A	Monitors clutch 1 slip by comparing the slip speed across the clutch to a slip threshold or comparing the calculated slip energy to an energy threshold.	Clutch 1 Slip Speed	>= 190.00 RPM	Line Pressure Estimate Clutch Torque Estimate Clutch Status Motor Speeds Wheel Slip Shutdown Command	>= 190.00 kPa > 74.00 Nm =Locked = not faulted =0 =0	Fail Condition met for 0.60 seconds out of 0.80 seconds Retry Count: 3.00	Type A, 1 Trips
			Clutch 1 Energy	>= 8,003.30 J	Line Pressure Estimate Clutch Torque Estimate Clutch Status Motor Speeds Wheel Slip Shutdown Command	>= 190.00 kPa > 74.00 Nm =Locked = not faulted =0 =0	Instantly once Clutch 1 Energy >= 8,003.30 J Retry Count: 3.00	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch 2 Slip	P079B	Monitors clutch 2 slip by comparing the slip speed across the clutch to a slip threshold or comparing the calculated slip energy to an energy threshold.	Clutch 2 Slip Speed	>= 100.00 RPM	Line Pressure Estimate	>= 190.00 kPa	Fail Condition met for 2.50 seconds out of 3.33 seconds	Type A, 1 Trips
					Clutch Torque Estimate	> 15.00 Nm		
					Clutch Status	=Locked		
					Motor Speeds	= not faulted	Retry Count: 3.00	
					Wheel Slip	=0		
					Shutdown Command	=0		
			Clutch 2 Energy	>= 5,851.40 J	Line Pressure Estimate	>= 190.00 kPa	Instantly once Clutch 1 Energy >= 5,851.40 J	
					Clutch Torque Estimate	> 15.00 Nm		
					Clutch Status	=Locked		
					Motor Speeds	= not faulted	Retry Count: 3.00	
					Wheel Slip	=0		
					Shutdown Command	=0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch 1 Stuck On	P07A3	Detects if clutch 1 is stuck on by comparing actual clutch 1 slip speed to a desired slip profile or by detecting that slip across the clutch is not above a threshold when slip is expected.	C1 Offgoing Slip Expected	=1	Motor Speed Clutch 1 State	= not faulted = offgoing	Fail condition met for 0.50 seconds out of 0.75 seconds. Retry Count: 3.00	Type A, 1 Trips
			C1 Slip Speed C1 Profiled Slip Speed	=< **Clutch1FailSlipSpeed** (See supporting table) >= **Clutch1ProfiledSlipSpdThd** (See supporting table)	Clutch Status Shutdown command Motor Speed	=Released =0 =not faulted	Fail condition met for 0.50 seconds out of 0.75 seconds. Retry Count: 3.00	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Clutch 2 Stuck On	P07A5	Detects if clutch 2 is stuck on by comparing actual clutch 2 slip speed to a desired slip profile or by detecting that slip across the clutch is not above a threshold when slip is expected.	C2 Offgoing Slip Expected	=1	Motor Speed Clutch 2 State	= not faulted =off going	Fail condition met for 0.50 seconds out of 0.75 seconds. Retry Count: 3.00	Type A, 1 Trips
			C2 Slip Speed C2 Profiled Slip Speed	=< **Clutch2FailSlipSpeed** (See supporting table) >= **Clutch2ProfiledSlipSpeedThd** (See supporting table)	Clutch Status Shutdown command Motor Speed	=Released =0 = not faulted	Fail condition met for 0.50 seconds out of 0.75 seconds. Retry Count: 3.00	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Upshift Switch Circuit	P0815	Checks to see if the manual tap up circuit is active for an expected amount of time while the IMS is in an expected range. Fail case 1 and fail case 2 must be met to trip this DTC.	IMS Position Tap Switch position	= **TapUpFail1Range** (See Supporting Table) = Tap Up	P0815 enable calibration P1761 P0836 Crank Diagnostic enable criteria met	= 1.00 (1 is enabled) NOT Fault Active (FA) NOT Fault Active (FA) AND NOT Test failed This Key On (TFTKO) AND NOT Fault Pending (FP) =True	Malfunction Criteria met for 2.00 seconds	Type C, No SVS
			IMS Position Tap Switch position	= **TapUpFail2Range** (See Supporting Table) = Tap Up	P0815 enable calibration P1761 P0836 Crank Diagnostic enable criteria met	= 1.00 (1 is enabled) NOT Fault Active (FA) NOT Fault Active (FA) AND NOT Test failed This Key On (TFTKO) AND NOT Fault Pending (FP) =True	Malfunction Criteria met for 655.00 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Downshift Switch Circuit	P0816	Checks to see if the manual tap down ciruit is active for an expected amount of time while the IMS is in an expected range. Fail case 1 and fail case 2 must be met to trip this DTC.	IMS Position Tap Switch position	= **TapDownFail1Range** (See Supporting Table) = Tap Down	P0816 enable calibration P1761 P0836 Crank Diagnostic enable criteria met	= 1.00 (1 is enabled) NOT Fault Active (FA) NOT Fault Active (FA) AND NOT Test failed This Key On (TFTKO) AND NOT Fault Pending (FP) =True	Malfunction criteria met for 2.00 seconds	Type C, No SVS
			IMS Position Tap Switch position	= **TapDownFail2Range** (See Supporting Table) = Tap Down	P0816 enable calibration P1761 P0836 Crank Diagnostic enable criteria met	= 1.00 (1 is enabled) NOT Fault Active (FA) NOT Fault Active (FA) AND NOT Test failed This Key On (TFTKO) AND NOT Fault Pending (FP) =True	Malfunction criteria met for 655.00 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Up and Downshift Switch Circuit	P0826	This DTC reports when the tap switch position is invalid after an expected period of time.	Tap Switch Position	=Invalid (NOT reported as "TapUp", "TapDwn" or "TapOff")	P0826 enable calibration P1761 Crank Diagnostic enable criteria met	= 1.00 (1 is enabled) NOT Fault Active (FA) =True	Malfunction critera met for 60.00 seconds	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid A Control Circuit Open	P0960	This DTC sets when the PCSA control circuit has been detected to be open	HWIO circuitry detects if an electrical circuit open is present or not. PCS A Circuit Open Fault Status	 =TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>=9.00 V and <=16.00V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid A Control Circuit Low Voltage	P0962	This DTC sets when the PCSA control circuit has been detected to be shorted to ground	HWIO circuitry detects if an electrical circuit low is present or not. PCS A Circuit Low Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>=9.00 V and <=16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid A Control Circuit High Voltage	P0963	This DTC sets when PCS1 has been detected to be shorted to power	HWIO circuitry detects if an electrical circuit high is present or not. PCS A Circuit High Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>=9.00 V and <=16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid B Control Circuit Open	P0964	This DTC sets when the PCSB control circuit has been detected to be open	HWIO circuitry detects if an electrical circuit open is present or not	HWIO circuitry detects if an electrical circuit open is present or not.	Battery Voltage	>= 9.00 V and <= 16.00 V	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips
			PCS B Open Circuit Fault Status	=TRUE	Ignition voltage	> = 11 Volts && <= 16 Volts		
					Engine Speed	>= 0 RPM && <= 7500 RPM for >= 5 seconds		
					Vehicle Speed	<= 200 mph for >= 5 seconds		
					PropSysActive	=1		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid B Control Circuit Low Voltage	P0966	This DTC sets when the PCSB control circuit has been detected to be shorted to ground	HWIO circuitry detects if an electrical circuit low is present or not PCS B Circuit Low Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.075 seconds in a 0.10 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid B Control Circuit High Voltage	P0967	This DTC sets when PCSb has been detected to be shorted to power or open circuited	HWIO circuitry detects if an electrical circuit high is present or not. PCS A Circuit High Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid C Control Circuit Open	P0968	This DTC sets when the PCSC control circuit has been detected to be open circuit	HWIO circuitry detects if an electrical circuit open is present or not. PCS C Open Circuit Fault Status	 =TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid C Control Circuit Low Voltage	P0970	This DTC sets when the PCSC control circuit has been detected to be shorted to ground	HWIO circuitry detects if an electrical circuit low is present or not.		Battery Voltage	>= 9.00 V and <= 16.00 V	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips
					Ignition voltage	> = 11 Volts && <= 16 Volts		
			PCS C Circuit Low Fault Status	=TRUE				
					Engine Speed	>= 0 RPM && <= 7500 RPM for >= 5 seconds		
					Vehicle Speed	<= 200 mph for >= 5 seconds		
					PropSysActive	=1		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid C Control Circuit High Voltage	P0971	This DTC sets when PCSC has been detected to be shorted to power or open circuited.	HWIO circuitry detects if an electrical circuit high is present or not. PCS C Circuit High Fault Status	 =TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid System Performance	P0AB9	This diagnostic indicates an autostart or autostop attempt has failed or an engine stall has occured.	Engine Sensed Torque	≤ 0.00 Nm	Commanded Engine Torque	> 20.00 Nm	Diagnostic will set in 15.00 s (runs at 12.5 ms)	Type A, 1 Trips
					Engine State	= Auto-starting		
					Low Fuel Condition	= FALSE		
					Fuel Level Data Fault	= FALSE		
					Engine Positiong Fault (CAM or Crank)	= FALSE		
					DTC's not Fault Active	= P16E0		
					Number of engine start re-try attempts	= 2		
			Engine Stopping State	= Preparing for Stop	Engine State	= Auto-stopping	Diagnostic will set in 15.00 s (runs at 12.5 ms)	
				OR	Low Fuel Condition	= FALSE		
			Engine Stopping State	= Disabling Fuel	Fuel Level Data Fault	= FALSE		
				OR	Engine Positiong Fault (CAM or Crank)	= FALSE		
			Engine Stopping State	= Ramping Down				
					DTC's not Fault Active	= P16E0		
			Engine Speed	< 300.00 RPM	Engine State	= Engine Running	25.00 RPM * seconds (integrated value) (runs at 12.5ms)	
					Low Fuel Condition	= FALSE		
					Fuel Level Data Fault	= FALSE		
					Engine Positiong Fault (CAM or Crank)	= FALSE	(i.e. if RPM is 25.00 below the 300.00 RPM threshold for 1 second, the	
					DTC's not Fault Active	= P16E0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Wheel Slip State	= No Wheel Slip	diagnostic will set, diagnostic will proportionally set faster as RPM dips further below the 300.00 RPM threshold)	
			Engiine Speed	< 800.00 AND > 300.00	Engine State Low Fuel Condition Fuel Level Data Fault Engine Positiong Fault (CAM or Crank) DTC's not Fault Active Wheel Slip State	= Engine Running = FALSE = FALSE = FALSE = P16E0 = No Wheel Slip	If the fail conditons are met for 0.50 s	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Phase U Current Low	P0B01	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.	Peak Phase Axis Current on the U Phase	< 1.00 Amps	Drive State	RUN	0.4 seconds out of a 0.6 seconds window (x of y)	Type A, 1 Trips
					Delay Timer	> 10.00 ms		
					Inverter State	≠Active Discharge		
					Inverter Power Stage	Normal PWM		
					Inverter Voltage	> 50.00 V		
					Rotor Position	-30 deg < Phase Axis < +30 deg		
					Squared Current Comanded	> 5.00 Amps^2		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Phase V Current Low	P0B04	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.	Peak Phase Axis Current on the V Phase	< 1.00 Amps	Drive State Delay Timer Inverter State Inverter Power Stage Inverter Voltage Rotor Position Squared Current Comanded	Run > 10.00 ms ≠Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 5.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Phase W Current Low	P0B07	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.	Peak Phase Axis Current on the W Phase	< 1.00 Amps	Drive State	RUN	0.4 seconds out of a 0.6 seconds window (x of y)	Type A, 1 Trips
					Delay Timer	> 10.00 ms		
					Inverter State	≠Active Discharge		
					Inverter Power Stage	Normal PWM		
					Inverter Voltage	> 50.00 V		
					Rotor Position	-30 deg < Phase Axis < +30 deg		
					Squared Current Comanded	> 5.00 Amps^2		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Current High	P0C28	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 implements the use of 2 different fail timers, one fast and one slow. The fast timer has a very short sample window so that the diagnostic will detect a sudden fault, the slower timer has a longer sample window to allow the diagnostic to detect an intermittent fault.	U, V, or W Phase Current Sensor	> 35.00 Amps	Wakeup Signal	On	0.00416 seconds out of a 0.0624 seconds window (x of y) OR 0.0104 seconds out of a 0.104 seconds window (x of y)	Type A, 1 Trips

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	Monitors the high voltage bus after contactors open to ensure sufficient drop in voltage occurs	High voltage inverter rationalized voltage after discharge	> 150 volts	Enable calibration is True High voltage main contactor status IF discharge during charging is Not Allowed THEN High voltage charging contactor status	= 1 (1 is Enabled) = OPEN = 1 (0 is Not Allowed) = OPEN	3.5 seconds Diagnostic must run 2 times before failure is reported	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Supply Voltage Circuit 2 Low Voltage	P150D	This diagnostic detects low supply voltage for the circuit 2 path for motor control. If the supply voltage circuit 2 path is below the indicated threshold for the indicated time the DTC is set.	12 volt battery supply circuit 2	< 8.00 Volts	Enable Calibration is True Diagnostic System Code Clear Requested Diagnostic System Reset Complete	= 1.00 (1 is Enabled) = False = True	2 seconds out of a 2.5 seconds window	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Supply Voltage Circuit 1 Low Voltage	P150E	This diagnostic detects low supply voltage for the circuit 1 path for motor control. If the supply voltage circuit 1 path is below the indicated threshold for the indicated time the DTC is set.	12 volt battery supply circuit 1	< 8.00 Volts	Enable Calibration is True Diagnostic System Code Clear Requested Diagnostic System Reset Complete	= 1.00 (1 is Enabled) = False = True	2 seconds out of a 2.5 seconds window	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Alive Rolling Count/ Protection Value Fault - Engine Actual Torque Steady State	P15F0	This diagnostic monitors the signal from the engine control module (ECM) to the THCP microprocessor with the engine torque data. Potential failures include the ECM transceiver, the transmission line, the THCP transceiver and the processing in both microprocessors. If the ECM does not increment an Alive Rolling Count (ARC) with each message or fails to send the message in time or fails to calculate the checksum correctly the fault is set in the THCP.	Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0-3) ≠ Protection Value	Propulsion System Active Run/Crank Active time AND Run/Crank Voltage OR Ignition Run/Crank Voltage	= TRUE >= 0.50 secomds >= 9.50 V >= 11.00 V	0.125 seconds out of a 0.2 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Alive Rolling Count/ Protection Value Fault - Commanded Axle Torque Predicted	P15F1	This diagnostic monitors the signal from the engine control module (ECM) to the THCP microprocessor with commanded engine torque data. Potential failures include the ECM transceiver, the transmission line, the THCP transceiver and the processing in both microprocessors. If the ECM does not increment a counter with each message or fails to send the message in time or fails to calculate the checksum correctly the fault is set in the THCP.	Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0-3) ≠ Protection Value	Run/Crank Active time AND (Run/Crank Voltage OR Ignition Run/Crank Voltage	>= 0.50 secomds >= 9.50 V >= 11.00 V	0.125 seconds out of a 0.2 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Alive Rolling Count/ Protection Value Fault - Contactor Status Signal Circuit	P15FC	This diagnostic monitors the signal from the VICM/BSM (HPCM2) to the THCP microprocessor with contactor status information. Potential failures include the VICM/BSM transceiver, the transmission line, the THCP transceiver and the processing in both microprocessors. If the VICM/BSM does not increment a counter with each message or fails to send the message in time or fails to calculate the checksum correctly the fault is set in the THCP.	Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0,1,2,3,0,1,2...) ≠ Protection Value	Ignition Status	= Run or Crank	0.45 seconds out of a 0.5 seconds window Executes every time PE GMLAN msg $1D8 is received	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Performance - No Torque Detected	P16E0	This diagnostic indicates that the engine is not producing torque	Reported Engine Torque - Sensed Engine Torque	> 50.00 Nm	All Secondary Parameters Listed below must be meet for 2.00 seconds		3.5 seconds out of a 4 seconds window	Type A, 1 Trips
					Engine Actual Torque Fault	= FALSE		
					DTC's not Fault Active	= U0100		
					Engine Start Stop State	= Engine Running		
					Engine Torque Command Immediate	≥ 50.00 Nm		
					Engine Sensed Torque	> 0.00 Nm		
					Low Fuel Condition	= FALSE		
					Fuel Level Data Fault	= FALSE		

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 THCP and MCP2 is working correctly. 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.	CRC (Cyclic Redundant Checksum) error on receive Number of missing messages OR Alive Rolling Count (ARC) incremented from previous value (0-3)	=True ≠ 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	0.175 seconds out of a 0.2 seconds window	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	0.175 seconds out of a 0.2 seconds window	
			Number of Missing Received Messages	> 4 messages	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	0.175 seconds out of a 0.2 seconds window	

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

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 THCP and MCP1 is working correctly. 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 in the time indicated.	CRC error on receive Number of missing messages OR Alive Rolling Count (ARC) incremented from previous value (0-3)	=True ≠ 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	0.175 seconds out of a 0.2 seconds window	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	0.175 seconds out of a 0.2 seconds window	
			Number of Missing Received Messages	> 4 messages	(Diagnostic System Code Clear Requested AND Diagnostic System Reset	= False = True	0.175 seconds out of a 0.2 seconds window	

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

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. There are fail cases for secure vehicle speed, transmission output sensor to wheel speed sensor conversion factor, and the engine torque value.	Rate Limited Secure Vehicle Speed (Re)	≠ Dual Stored Rate Limited Secure Vehicle Speed (Ve)	Run Crank Voltage Enable Calibration is True	>= 11.00 V = 1 (1 is Enabled)	0.125 seconds out of a 0.2 seconds window	Type A, 1 Trips
			TOS to Wheel Speed Conversion Factor TOS to Wheel Speed Conversion Factor	>= 1.10 (High & Neu) OR <= 0.10 (High & Neu) >= 1.10 (4WD Low) OR <= 0.10 (4WD Low)	Run Crank Voltage	>= 11.00 V	0.125 seconds out of a 0.2 seconds window	
			Engine Actual Torque Steady State WOM (Ve)	≠ Dual Stored Engine Actual Torque Steady State WOM (We)	Run Crank Voltage	>= 11.00 V	0.125 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Transmission Range Control Performance	P16F4	Detects transmission range errors by comparing the Direction IMS switches with the Range IMS information from the THCP.	Valid Range IMS transmission position	≠ Valid Direction IMS transmission position	Run/Crank Voltage	>= 9.50 Volts	150.00 ms out of a 200.00 ms window Executes in a 25ms loop	Type A, 1 Trips
		DTC Fail case 1: Positive transmission ranges that do not match DTC Fail case 2: Error corrected Direction IMS does not match	Valid Range IMS transmission position	≠ Error corrected Direction IMS transmission position	Run/Crank Voltage	>= 9.50 Volts	150.00 ms out of a 200.00 ms window Executes in a 25ms loop	
		DTC Fail case 3: Range IMS is between valid transmission positions and Direction IMS is error corrected	Range IMS indicates a transitional state AND Direction IMS has an error corrected transmision position		Run/Crank Voltage	>= 9.50 Volts	150.00 ms out of a 200.00 ms window Executes in a 25ms loop	
		DTC Fail case 4: Range IMS is invalid and Direction IMS is error corrected DTC Fail case 5: Range IMS is between valid transmission positions and Direction IMS is invalid	Range IMS is invalid due to a fault or problem with THCP, AND the Direction IMS has an error corrected transmission position		Run/Crank Voltage	>= 9.50 Volts	150.00 ms out of a 200.00 ms window Executes in a 25ms loop	
		DTC Fail case 6: Range IMS and Direction IMS are both invalid	Range IMS indicates a transitional state AND Direction IMS is invalid due to a fault or problem with the THCP		Run/Crank Voltage	>= 9.50 Volts	150.00 ms out of a 200.00 ms window Executes in a 25ms loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Range IMS is invalid due to a fault or problem with the THCP, AND the Direction IMS is invalid due to a fault or a problem with the THCP		Run/Crank Voltage	>= 9.50 Volts	150.00 ms out of a 200.00 ms window Executes in a 25ms loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Commanded Range State	P16F6	This diagnostic verifies the calculation of the Transmission Range State. Potential failure modes could be the calculation of range state, range state transitions or the calculation of input torque does not match the range state. The DTC sets if there are mismatches in system equations, or the transmission range state being executed is invalid, or the transmission range state has performed an invalid transition or the input torque can not be rationalized with the range state.	The current Transmission Range State being used is detected to be an invalid value within the current Transmission range State Group		(Run/Crank Voltage OR Ignition Voltage) Enable range equation check is True Enable state machine rationality check is True Enable clutch control rationality check is True	>= 11.00 V >= 9.50 V = 1 (1 is Enabled) = 1 (1 is Enabled) = 1 (1 is Enabled)	0.2 seconds out of a 0.2125 seconds window	Type A, 1 Trips
			The current Transmission Range State Group being used by the system is an invalid value		(Run/Crank Voltage OR Ignition Voltage) Enable range equation check is True Enable state machine rationality check is True Enable clutch control rationality check is True	>= 11.00 V >= 9.50 Volts = 1 (1 is Enabled) = 1 (1 is Enabled) = 1 (1 is Enabled)	0.2 seconds out of a 0.2125 seconds window	
			The current Transmission Range State has changed, and the change in value is not one of the supported transitions from the previous Transmission Range State		(Run/Crank Voltage OR Ignition Voltage) Enable range equation check is True Enable state machine rationality check is True Enable clutch control rationality check is True	>= 11.00 V >= 9.50 V = 1 (1 is Enabled) = 1 (1 is Enabled) = 1 (1 is Enabled)	0.2 seconds out of a 0.2125 seconds window	
			The Range Equation can not be rationalized against the current Transmission Range State		(Run/Crank Voltage OR Ignition Voltage) Enable range equation check is True	>= 11.00 V >= 9.50 V = 1 (1 is Enabled)	0.2 seconds out of a 0.2125 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Enable state machine rationality check is True Enable clutch control rationality check is True	= 1 (1 is Enabled) = 1 (1 is Enabled)		
			The Torque Determination State can not be rationalized against the current Transmission Range State		(Run/Crank Voltage OR Ignition Voltage) Enable range equation check is True Enable state machine rationality check is True Enable clutch control rationality check is True	>= 11.00 V >= 9.50 V = 1 (1 is Enabled) = 1 (1 is Enabled) = 1 (1 is Enabled)	0.2 seconds out of a 0.2125 seconds window	
			The Input Torque Optimization State can not be rationalized against the current Transmission Range State		(Run/Crank Voltage OR Ignition Voltage) Enable range equation check is True Enable state machine rationality check is True Enable clutch control rationality check is True	>= 11.00 V >= 9.50 V = 1 (1 is Enabled) = 1 (1 is Enabled) = 1 (1 is Enabled)	0.2 seconds out of a 0.2125 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Pressure Control Solenoid Command Incorrect	P16F7	This diagnostic detects whether the solenoids driving the clutches are in the correct states. If a pressure solenoid is commanded off and the electronic feedback indicates it is in the "on" state the DTC sets in the indicated time. If the pressure solenoid is commanded on and the electronic feedback indicates the solenoid is "off" the DTC sets in the indicated time.	Clutch commanded off OR Clutch commanded on	= Clutch State On = Clutch State Off	Direct control of Solenoids AND Direct control of clutches AND Hydralic default state AND (Run Crank Voltage OR Ignition Voltage)	= Inactive = Inactive = False >= 11.00 V >= 9.50 V	0.125 seconds out of a 0.2 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Up and Downshift Switch Signal Circuit	P1761	This DTC reports if the tap up tap down switch signal has had an error count greater than a threshold for an expected period of time.	Number of tap up tap down signal rolling count errors	> 3.00	P1761 enable calibration Tap Up Tap Down Switch messages from Platform are equal to the expected value Run Crank Ignition voltage diagnostic conditions met	= 1.00 (1 is enabled) =TRUE =TRUE	Malfunction criteria met for 10.00 seconds	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Overspeed	P179A	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.	ABS(Motor Speed)	> 6,500.00 rpm	Wakeup Signal	On	5.00 instances of failure within 10.00 seconds where each failure is counted when failure conditions have been met for 0.0832 seconds out of a 0.1664 seconds window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Clutch 1 Slip Adapt	P179C	Detects an excessive amount of clutch slip adapt from slip intervention	Max clutch 1 capacity reserve adapt	= 1	Enable Calibration is True Hydraulic System	= 1 (1 is Enabled) = Enabled	10.00 cycles of max clutch capacity reserve adapt being observed	Type B, 2 Trips
			Slip intervention requested without holding the adapt	= 1	Enable Calibration is True Hydraulic System	= 1 (1 is Enabled) = Enabled	65,535.00 cycles of slip intervention without holding the adapt being observed	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Clutch 2 Slip Adapt	P179D	Detects an excessive amount of clutch slip adapt from slip intervention	Max clutch 2 capacity reserve adapt	= 1	Enable Calibration is True Hydraulic System	= 1 (1 is Enabled) = Enabled	10.00 cycles of max clutch capacity reserve adapt being observed	Type B, 2 Trips
			Slip intervention requested without holding the adapt	= 1	Enable Calibration is True Hydraulic System	= 1 (1 is Enabled) = Enabled	65,535.00 cycles of slip intervention without holding the adapt being observed	

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch P Circuit High Voltage	P1824	This DTC Monitors if the IMS P Circuit is Shorted to a high voltage	IMS P Voltage	> 2.49	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch A Circuit Low Voltage	P182A	This DTC Monitors if the IMS A Circuit is Shorted to a Low Voltage	IMS A Voltage	<= 0.66	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts =1 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch B Circuit Low Voltage	P182B	This DTC Monitors if the IMS B Circuit is Shorted to a Low Voltage	IMS B Voltage	<= 0.66	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch B Circuit High Voltage	P182C	This DTC Monitors if the IMS B Circuit is Shorted to a high voltage	IMS B Voltage	> 2.49	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch P Circuit Low Voltage	P182D	This DTC Monitors if the IMS P Circuit is Shorted to a Low Voltage	IMS P Voltage	<= 0.66	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch Invalid Range	P182E	This DTC Monitors if the IMS is Reporting an invalid range, meaning that the position of the IMS cannot be determined from the states of the individual IMS bits.	Converted Directional IMS	= Illegal	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 2.70 seconds in a 3.13 second window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch C Circuit High Voltage	P182F	This DTC Monitors if the IMS C Circuit is Shorted to a high voltage	IMS C Voltage	> 2.49	Ignition Voltage	>= 9.0 volts and <= 32.0 volts	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips
					Run/Crank Voltage	> 6.00 volts		
					Enable Calibration is True	= 1 (1 is Enabled)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch A Circuit High Voltage	P1838	This DTC Monitors if the IMS A Circuit is Shorted to a high voltage	IMS A Voltage	> 2.49	Ignition Voltage	>= 9.0 volts and <= 32.0 volts	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips
					Run/Crank Voltage	> 6.00 volts		
					Enable Calibration is True	= 1 (1 is Enabled)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch C Circuit Low Voltage	P1839	This DTC Monitors if the IMS C Circuit is Shorted to a Low Voltage	IMS C Voltage	<= 0.66	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch S Circuit Low Voltage	P1840	This DTC Monitors if the IMS S Circuit is Shorted to a Low Voltage	IMS S Voltage	<= 0.66	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch S Circuit High Voltage	P1841	This DTC Monitors if the IMS S Circuit is Shorted to a high voltage	IMS S Voltage	> 2.49	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch A Circuit Short	P18B5	This DTC reports if the monitored an IMS A Circuit voltage is between the max voltage for the valid low range and the min voltage for the valid high range.	IMS A Voltage	> 1.02 Volts and < 1.62 Volts	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch B Circuit Short	P18B6	This DTC reports if the monitored an IMS B Circuit voltage is between the max voltage for the valid low range and the min voltage for the valid high range.	IMS A Voltage	> 1.02 Volts and < 1.62 Volts	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch C Circuit Short	P18B7	This DTC reports if the monitored an IMS C Circuit voltage is between the max voltage for the valid low range and the min voltage for the valid high range.	IMS A Voltage	> 1.02 Volts and < 1.62 Volts	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch P Circuit Short	P18B8	This DTC reports an IMS P Circuit short if the monitored voltage is between the max voltage for the valid low range and the min voltage for the valid high range.	IMS P Voltage	> 1.02 Volts and < 1.62 Volts	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch S Circuit Short	P18B9	This DTC reports if the monitored an IMS S Circuit voltage is between the max voltage for the valid low range and the min voltage for the valid high range.	IMS S Voltage	> 1.02 Volts and < 1.62 Volts	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 1.75 seconds in a 2.00 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch A Stuck Off	P18BA	This DTC Monitors if the IMS A Circuit is Stuck Off, meaning that the circuit is in the valid low state when it is expected to be in the valid high state.	Converted Directional IMS Directional IMS A	Transitional 30 IMS A has not been observed valid Low	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is enabled)	Fail condition met for 2.70 seconds in a 3.13 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch C Stuck Off	P18BC	This DTC Monitors if the IMS C Circuit is Stuck Off, meaning that the circuit is in the valid low state when it is expected to be in the valid high state.	Converted Directional IMS Directional IMS C	Transitional 27 IMS C has not been observed valid Low	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is enabled)	Fail condition met for 2.70 seconds in a 3.13 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch A Stuck On	P18BF	This DTC Monitors if the IMS A Circuit is Stuck On, meaning that the circuit is in the valid high state when it is expected to be in the valid low state.	Converted Directional IMS AND Directional IMS A	Transitional 17 IMS A has not been observed in the valid High state	Ignition Voltage Run/Crank Voltage Enable Calibration is True Converted Directional IMS AND Directional IMS A	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled) =Transitional 2 Has not been observed High in park for 1.50 seconds	Fail condition met for 2.70 seconds in a 3.13 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch B Stuck On	P18C0	This DTC Monitors if the IMS B Circuit is Stuck On, meaning that the circuit is in the valid high state when it is expected to be in the valid low state.	Converted Directional IMS AND Directional IMS B	Drive IMS B has not been observed High	Ignition Voltage Run/Crank Voltage Enable Calibration is True Converted Directional IMS AND Directional IMS B	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled) Drive Has not been observed High in Park for 1.50 seconds.	Fail condition met for 2.70 seconds in a 3.13 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch P Stuck On	P18C2	This DTC Monitors if the IMS P Circuit is Stuck On, meaning that the circuit is in the valid high state when it is expected to be in the valid low state.	Converted Directional IMS AND Directional IMS P	Transitional 24 IMS P as not been observed High	Ignition Voltage Run/Crank Voltage Enable Calibration is True	>= 9.0 volts and <= 32.0 volts > 6.00 volts = 1 (1 is Enabled)	Fail condition met for 2.70 seconds in a 3.13 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Mode Switch S Stuck On	P18C3	This DTC Monitors if the IMS S Circuit is Stuck On, meaning that the circuit is in the valid high state when it is expected to be in the valid low state.	Converted Directional IMS AND Directional IMS S	LowManual IMS S has not been observed High	Ignition Voltage Run/Crank Voltage Converted Directional IMS Enable Calibration is True AND Directional IMS S	>= 9.0 volts and <= 32.0 volts > 6.00 volts =Park = 1 (1 is Enabled) has not been observed High in park for 1.50 seconds	Fail condition met for 2.70 seconds in a 3.13 second window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Alive Rolling Count/ Protection Value Fault - Regenerative Braking Torque Request Circuit	P1B15	This diagnostic monitors the signal from the electronic brake control module (EBCM) to the THCP microprocessor with the regenerative braking torque request data. Potential failures include the EBCM transceiver, the transmission line, the THCP transceiver and the processing of the signal in both microprocessors. If the EBCM does not increment a counter with each message or fails to send the message in timetime or fails to calculate the checksum correctly the fault is set in the THCP. Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC counter and verifying the Protection Value of the Regenerative Braking Torque Request Circuit	Current ARC value OR Primary signal value	≠ Previous ARC value plus 1 (0-3) ≠ Protection Value	Run/Crank Active time AND Run/Crank Voltage OR Ignition Run/Crank Voltage	>= 0.50 seconds >= 9.50 Volts >= 11.00 V	0.1875 seconds out of a 0.25 seconds window Executes every time CE GMLAN msg $235 is received	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Hybrid Battery Voltage Isolation Sensing Performance	P1E1B	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 high voltage positive and negative leg. 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.	ABS(Total High Voltage Measured By the Battery Pack - High Voltage Measured from Positve to Ground - High Voltage Measured from Negative to Ground)	>= 70.00 V	No Active DTCs: Controller Initialization Contactors	P1AE8, P1AE9, P1B0B, P1B0C Complete Closed	0.175 seconds out of a 0.2 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit Low	P1E1C	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	Pos mid-pack voltage	< 20.00 Volts	Controller Initialization Run Crank Active Contactors	Complete True Closed	0.7 seconds out of a 1.5 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit High	P1E1D	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.	High Voltage Positive to Ground Reading - Total High Voltage Reading from High Voltage Battery	> 60.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.5 seconds out of a 1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit Low	P1E1E	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.	Negative mid-pack voltage	< 20.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.7 seconds out of a 1 seconds window (x o y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit High	P1E1F	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.	High Voltage Positive to Ground Reading - Total High Voltage Reading from High Voltage Battery	> 60.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.5 seconds out of a 1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Hybrid Battery Voltage System Isolation Fault	P1E22	This diagnostic monitors the high voltage bus for possible shorts 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.	Isolation Ratio (Neg mid-pack voltage / Pos mid-pack voltage)	> 4.53 OR < 0.21	No Active DTCs: Controller Initialization	P1AE8, P1AE9, P1AEC Complete	2.5 seconds out of a 5 seconds window (x of y)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Control Module Calculated Motor Position Performance	P1E29	This diagnostic monitors the auxiliary fluid pump for a loss of control. The calculated motor speed achieved is compared to a threshold. If the achieved speed is lower than the fail threshold for sufficient time, the diagnostic will fail.	Motor Speed Achieved	< -500.00 rpm	Wakeup Signal	ON	5.00 Retries Allowed after failure conditions met for 0.0006 seconds out of a 0.002 seconds window	Type A, 1 Trips
			Rotor Speed (Electrical Radians Per Second)	> 62.80 Rad/S	Wakeup Signal	ON	5.00 Retries Allowed after failure conditions met for 0.0006 seconds out of a 0.002 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Phase U Current Sensor Circuit Low	P1E2A	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.	U Phase current sensor output at highside	< -50.00 Amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Phase U Current Sensor Circuit High	P1E2B	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.	U phase current sensor output at highside	> 50.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Phase U Current Sensor Circuit Range/ Performance	P1E2C	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, if the offset value is larger than the fail threshold the diagnostic will fail.	U phase current sensor offset learn value	> 2.00 amps	Wakeup Signal Delay Timer Motor Fauts Inverter Faults	On 0.10 Sec None None	Fail conditions met 0.10 sec after enable conditions met	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Phase V Current Sensor Circuit Low	P1E2D	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.	U phase current sensor output at highside	< -50.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Phase V Current Sensor Circuit High	P1E2E	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.	V phase Current Sensor output highside	> 50.00	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Phase V Current Sensor Circuit Range/ Performance	P1E2F	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.	U phase current sensor offset learn value	> 2.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fail conditions met 0.10 sec after enable conditions met	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Inverter Temperature Sensor Circuit High	P1E34	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.	PIM Temperature Sensor A	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON ≥ 600.00 s ≥ABS(1.00)Nm	2.5 seconds out of a 3.5 seconds window (x of y)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Inverter Termperature Sensor Circuit Low	P1E35	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.	PIM Temperature Sensor A	> 170.00 degrees C	Sensor Exists WakeUp Signal	= 1.00 On	2.5 seconds out of a 3.5 seconds window (x of y)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Inverter Temperature Sensor Circuit Range/ Performance	P1E36	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 certain 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.	ABS(Inverter A Temp-Cold Soak Average Temp)	> 10.00 degrees C	Vehicle off time Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Delay timer after controller initialization	≥ 9.17 hours > -20.00 °C P0AF0 and P0AEF > 5.13 second	0.5 seconds out of a 0.6 seconds window (x of y)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Inverter Over Temperature	P1E37	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.	PIM Phase U Temperature	> 128.00 degrees C	PIM Phase U Temperature	TEMP NORMAL	1.2 seconds out of a 2 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Power Supply Circuit/Open	P1E38	This diagnostic monitors the status of the IGBTs. The IGBT module will continuously monitor the supply circuit voltage. When the supply circuit drops below a threshold voltage the module then report out a status of being in a Bias fault. If the Bias fault status is present for sufficient time, the diagnostic will fail.	Phase A, B, or C Power Supply	Failed (Status Fault Bit)	Inverter State	Initialization Complete	0.002 seconds out of a 0.024 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmissioni Fluid Pump Motor Inverter Performance	P1E39	This diagnostic monitors the status of the IGBTs. The IGBT module will continually monitor the IGBTs for a short between the upper and lower phase. The module will then report out a status of being in a DeSat fault. If the DeSat fault status is present for sufficient time, the diagnostic will fail.	Phase A, B, or C High or Low Side IGBT	DSatFltPending (Status Fault Bit)	Wakeup Signal	ON	0.002 seconds out of a 1 seconds window (x of y)	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxilliary Transmission Fluid Pump Motor Torque Delivered Performance	P1E3A	This diagnostic is a plausibility check of the auxilliary motor speed and torque. Potential failure modes include the motor's ability to maintain a speed and the motor speed sensing circuits. When the difference between commanded auxilliary motor speed and actual auxilliary motor speed is greater than the indicated threshold and the torque is greater than the indicated threshold for longer than the timer threshold, the DTC is set.	(Motor speed using AB pulse from RDC - Motor speed from MCP) AND Motor torque commanded	> 200.00 > 6.50	Diagnostic is enabled AND Motor speed fault active AND Motor control	= 1.00 (1 = Run diagnostic) = False = Normal PWM control	(Motor RPM based) 80 failed revolutions out of 2,500 revolutions multiplied by 5.00 failed retry attempts	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 Redundant Drive Motor A Speed Sensing Circuit	P1E4A	This diagnostic is a check of the motor A speed detection circuitry. When the difference between the THCP's motor A speed from the resolver circuit and the MCPA's motor speed from the emulated encoder circuit are greater than the indicated threshold for longer than the timer threshold, the DTC is set.	Difference between Resolver based Motor Speed and Emulated Encoder based Motor Speed	> 400.00 rpm	Enable Calibration is True AND (Run/Crank Voltage OR Ignition Run/Crank Voltage) AND SPI Receive Fault Active	= 1 (1 is Enabled) >= 9.50 Volts >= 11.00 V = FALSE	3.3375 seconds out of a 5 seconds window	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 Redundant Drive Motor B Speed Sensing Circuit	P1E4B	This diagnostic is a check of the motor B speed detection circuitry. When the difference between the THCP's motor B speed from the resolver circuit and the MCPB's motor speed from the emulated encoder circuit are greater than the indicated threshold for longer than the timer threshold, the DTC is set.	Difference between Resolver based Motor Speed and Emulated Encoder based Motor Speed	> 400.00 rpm	Enable Calibration is True AND (Run/Crank Voltage OR Ignition Run/Crank Voltage) AND SPI Receive Fault Active	= 1 (1 is Enabled) >= 9.50 Volts >= 11.00 V = FALSE	3.3375 seconds out of a 5 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Motor Inverter Temperature Sensor Circuit Erratic	P1F00	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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 0.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	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 System Discharge Switch Circuit Performance	P1F63	Voltage drop over a given time is monitored to ensure discharge circuit is performing as expected.	High voltage rationalized inverter voltage delta during discharge switch commanded on time	< 10 volts = 0.1 seconds	Enable calibration is True High voltage inverter rationalized voltage before discharge High voltage inverter rationalized voltage after discharge completes Motor Speeds High voltage main contactor status IF discharge during charging is Not Allowed THEN High voltage charging contactor status	= 1 (1 is Enabled) > 260 Volts < 150 Volts < 200 RPM = OPEN = 1 (0 is Not Allowed) = OPEN	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.
Hybrid/EV System Discharge Switch Circuit Low	P1F64	Monitors the high voltage discharge switch for a circuit low fault	Active discharge circuit open status	HWIO determines if the active discharge resistor is failed open. =TRUE	Enable calibration is True	= 1 (1 is Enabled	0.125 seconds out of a 0.15 seconds window	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 System Discharge Switch Circuit High	P1F65	Monitors the high voltage discharge switch for a circuit high fault	Active discharge circuit high status	HWIO determines if the active discharge resistor is failed high. =TRUE	Enable calibration is True	= 1 (1 is Enabled)	0.125 seconds out of a 0.15 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Vehicle Speed Output Shaft Speed Correlation	P215B	The DTC Monitors if the Difference between the Transmission Output Speed, Output Speed Calculated from the Wheel Speed Sensors, and Output Speed Calculated from the Motor Speeds. The DTC sets if 2 of the 3 vehicle speed sources do not match.	Transmission Output Speed and Output Speed Calculated from the Wheel Speed Sensors and Output Speed Calculated from the Motor Speeds difference	> 12.42 mph	Number of Secured Vehicle Speed Sources	CeVSPI_e_ThreeSrcSystem		Type A, 1 Trips
					Secured Vehicle Speed Use Transmission Output Speed	1	2.00 seconds	
					Secured Vehicle Speed Use Wheel Speed	1	2.00 seconds	
					Secured Vehicle Speed Use Motor Speed	1	0.15 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Output Shaft Speed (OSS) - Wheel Speed Correlation	P215C	The DTC calculates the difference between the output shaft speed measured from the transmission output speed sensor (TOSS) and the output shaft speed calculated from the average of the wheel speed sensors then reports if they differ from each other by a threshold for a calibrated period of time. There is a different set of enable conditions when the TOS calculated from wheel speeds and TOS calculated from motor speeds are above or below a threshold.	Difference between Transmission Output Speed and the Calculated Average of Output Speed from the Motors and Wheel Speed Sensors	≥ 50.00 RPM	Enable Calibration is True OBD Wheel Speed Sensors Driven Wheel Estimated Vehicle Speed Fault Propulsion System Active TOS calculated from Wheel Speeds TOS calculated from Motor Speeds	= 1 (1 is Enabled) True False True ≥ 200.00 RPM ≥ 200.00 RPM	0.23 seconds	Type B, 2 Trips
			Difference between Transmission Output Speed and the Calculated Average of Output Speed from the Motors and Wheel Speed Sensors	≥ 60.00 RPM	Enable Calibration is True OBD Wheel Speed Sensors Driven Wheel Estimated Vehicle Speed Fault Propulsion System Active TOS calculated from Wheel Speeds TOS calculated from Motor Speeds	= 1 (1 is Enabled) True False True ≤ 200.00 RPM ≤ 200.00 RPM	0.23 seconds	

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 a run crank relay open circuit	Runk Crank Line Voltage	≤ 2.0 Volts	Enable Calibration is True CAN Communication ECM Run Crank Active CAN Data Diagnostic System Code Clear Requested Diagnostic System Reset Complete	= 1 (1 is Enabled) Enabled Available and Active = False = True	Fail condition met for 2.50 seconds in a 5.00 second window.	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 a run crank relay short to power	Runk Crank Line Voltage	> 6.0 V	Enable Calibration is True CAN Communication ECM Run Crank Active CAN Data Diagnostic System Code Clear Requested Diagnostic System Reset Complete	= 1 (1 is True) Enabled Available and False = False = True	Fail condition met for 2.50 seconds in a 5.00 second window.	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 Accessory Position Circuit Low	P2537	Detects an accessory position circuit open	Accessory	False	P2537	Not Test Failed This Key On and Not Test Passed This Key On	0.10 seconds	Type B, 2 Trips
					Propulsion System	Active		
					Propulsion System Active Time	> 0.50 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HSD2 Actuator Supply Circuit Voltage Low	P2670	This diagnostic reports when a high side driver 2 circuit low fault is detected by the current supply driver and is reported via HWIO.	HWIO circuitry detects if an electrical circuit low is present or not. HSD 2 Short to Ground Fault Status	 =TRUE	Enable Calibration is True HSD 2	= 1 (1 is Enabled) = On	0.13125 seconds out of a 0.15625 seconds window	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
HSD2 Actuator Supply Circuit Voltage High	P2671	This diagnostic reports when a high side driver 2 circuit high fault is detected by the current supply driver and is reported via HWIO.	HWIO circuitry detects if an electrical circuit high is present or not. HSD 2 Short to Power Fault Status	=TRUE	Enable Calibration is True	= 1 (1 is Enabled)	0.00625 seconds (1 Loop)	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid D Control Circuit Open	P2718	This DTC sets when the PCSD control circuit has been detected to be open circuit	HWIO circuitry detects if an electrical circuit open is present or not. PCS D Open Circuit Fault Status	 =TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid D Control Circuit Low Voltage	P2720	This DTC sets when the PCSD control circuit has been detected to be open circuit or shorted to power	HWIO circuitry detects if an electrical circuit low is present or not. PCS D Circuit Low Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.03 seconds in a 0.04 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid D Control Circuit High Voltage	P2721	This DTC sets when PCSD has been detected to be shorted to battery	HWIO circuitry detects if an electrical circuit high is present or not. PCS D Circuit High Fault Status	 =TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid E Control Circuit Open	P2727	This DTC sets when the PCSE control circuit has been detected to be open circuit	HWIO circuitry detects if an electrical circuit open is present or not. PCS E Open Circuit Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid E Control Circuit Low Voltage	P2729	This DTC sets when the PCSE control circuit has been detected to be open circuit or shorted to ground	HWIO circuitry detects if an electrical circuit low is present or not. PCS E Circuit Low Fault Status	=TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid E Control Circuit High Voltage	P2730	This DTC sets when PCS5 has been detected to be shorted to power	HWIO circuitry detects if an electrical circuit high is present or not. PCS E Circuit High Fault Status	 =TRUE	Battery Voltage Ignition voltage Engine Speed Vehicle Speed PropSysActive	>= 9.00 V and <= 16.00 V > = 11 Volts && <= 16 Volts >= 0 RPM && <= 7500 RPM for >= 5 seconds <= 200 mph for >= 5 seconds =1	Fail condition met for 0.30 seconds in a 0.40 second window.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auxiliary Transmission Fluid Pump Performance	P2797	This diagnostic monitors the aux pump performance based on aux pump filtered desired speed and actual speed values.	Difference between desired and actual aux pump speed AND Aux Pump Motor Estimated Temperature	See supporting tables for P2797 failure threshold **P2797 Pump Performance Speed Delta Threshold** < 165C	Aux Pump Speed Command Run/Crank Voltage	>= 5.00 RPM for 1.00 s > 6.00 volts	Fail Condition met for 3.00 seconds in a 3.75 second window	Type A, 1 Trips
			Difference between desired and actual aux pump speed AND Aux Pump Motor Estimated Temperature	See supporting tables for P2797 failure threshold **P2797 Pump Performance Speed Delta Threshold Case 2** > 165C	Aux Pump Speed Command Run/Crank Voltage	>= 5.00 RPM for 1.00 s > 6.00 volts	Fail Condition met for 2.00 seconds in a 2.50 second window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DID 76 Calibration Incorrect	P27A7	Detects if the solenoid calibration is incorrect	Solenoid not programmed	=1			Instantly	Type A, 1 Trips
			Solenoid programming falut(stored solenoid type and class configuration calibrations do not match)	=1			Instantly	
			Checksum Mismatch	=1			Instantly	
			Access Decreasing Fault	=1			Instantly	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Drive Motor Control Performance	P3260	This diagnostic checks that the engine speed and motor torque go below thresholds when the driver shifts to neutral. When the driver shifts to neutral and the vehicle speed is below the shown threshold the vehicle should turn off the engine and reduce the motor torque to near zero Nm. When shifted to neutral, if the engine speed does not fall below the threshold or motor torque is not removed in the shown time then the DTC is set. A second fail case is checked after the above conditions are correct the engine speed and motor torque values are continuously monitored to be sure they stay in range, otherwise the DTC is set.	((Motor A torque AND Ignore Motor A torque) OR (Motor B torque AND Ignore Motor B torque) OR (Engine speed AND Ignore Engine speed))	!< 1.00 Nm = 0.00 (0 = use Motor A torque) !< 1.00 Nm != 1.00 (1 = Do not use Motor B torque) !< 200.00 RPM = 1.00 (0 = use Engine speed)	Vehicle speed AND No motor neutral diagnostic enabled AND Gear position	< 5.00 kph = 1 (1 = Enabled) = CeHSER_e_N1_RngEqn (Neutral)	Timer from shift to neutral to all conditions being met > 33.00 seconds Debounce timer > 375.00 msec	Type A, 1 Trips
			((Motor A torque AND Ignore Motor A torque) OR (Motor B torque AND Ignore Motor B torque) OR (Engine speed AND Ignore Engine speed))	!< 1.00 Nm = 0.00 (0 = use Motor A torque) < 1.00 Nm != 1.00 (1 = do not use Motor B torque) !< 200.00 RPM = 1.00 (0 = use Engine speed)	Case 1 test passed AND Gear position	= CeHSER_e_N1_RngEqn (Neutral)	Debounce timer > 375.00 msec	

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 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.	Bus off failures exceeds before the sample time is reached	4 counts (equivalent to 0.05 seconds)	General Enable Criteria:		0.05 seconds out of 0.56 seconds	Type A, 1 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:			
					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.
Control Module Communication on Bus B Off	U0074	This diagnostic detects that 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.	Bus off failures exceeds before the sample time is reached	4 counts (equivalent to 0.05 seconds)	General Enable Criteria:		0.05 seconds out of 0.56 seconds	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.
Control Module Communication on Bus E Off	U0077	This diagnostic detects that BUS E is off or is non-operational. If the host controller can not transmit on BUS E in the indicated time the DTC is set.	Bus off failures exceeds before the sample time is reached	4 counts (equivalent to 0.05 seconds)	General Enable Criteria: U0077 Normal CAN transmission on Bus E 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 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	0.05 seconds out of 0.56 seconds	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/PCM A	U0100	This diagnostic detects that the engine control module (ECM) has stopped sending messages on Bus A. If ECM message traffic is not received on Bus A by the host controller in the indicated time the DTC is set.	Message is not received from controller for		General Enable Criteria:		See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			Message $0AA	≥ 0.50 seconds				
					Normal CAN transmission on Bus A	Enabled		
			Message $0C9	≥ 10.00 seconds				
			Message $1A3	≥ 10.00 seconds	Device Control	Not Active		
			Message $1AA	≥ 10.00 seconds	High Voltage Virtual Network Management	Not Active		
			Message $1C5	≥ 10.00 seconds				
					Ignition Voltage Criteria:			
			Message $287	≥ 10.00 seconds				
					Ignition voltage	>= 9.50		
			Message $3DC	≥ 10.00 seconds				
			Message $3E9	≥ 10.00 seconds				
					Power Mode	= run		
			Message $3FB	≥ 10.00 seconds				
					Off Cycle Enable Criteria:			
			Message $4A3	≥ 10.00 seconds				
					Enable Calibration is True	= 1 (1 indicates enabled)		
			Message $4C1	≥ 10.00 seconds				
					Ignition Accessory Line and			
			Message $4C7	≥ 10.00 seconds		= Active		
					Battery Voltage			
			Message $4F1	≥ 10.00 seconds		> 9.50		
			Message $589	≥ 10.00 seconds	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		
					U0100	Not Active on Current Key		

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		

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 has stopped sending messages. If brake system control module message traffic is not received by the host controller in the indicated time the DTC is set.	Message is not received from controller for Message $0C1 Message $0C5 Message $0D1 Message $0F1 Message $1E9 Message $4E9	 ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 10.0 seconds ≥ 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: 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 U0129	 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	See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips

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 has stopped sending messages. If Hybrid Powertrain Control Module B message traffic is not received by the host controller in the indicated time the DTC is set.	Message is not received from controller for		General Enable Criteria:		See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			Message $3DD	≥ 10.00 seconds				
					Normal CAN transmission on Bus A	Enabled		
			Message $4CB	≥ 10.00 seconds				
					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 indicates 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	> 3.0000 seconds		
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		
					U179A	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.
					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 Bus B. If ECM message traffic is not received on Bus B by the host controller in the indicated time the DTC is set.	Message is not received from controller for		General Enable Criteria:		See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0074	Not Active on Current Key Cycle		
			Message $091	≥ 10.00 seconds				
			Message $0A5	≥ 10.00 seconds	Normal CAN transmission on Bus A	Enabled		
			Message $184	≥ 0.50 seconds	Device Control	Not Active		
			Message $187	≥ 10.00 seconds	High Voltage Virtual Network Management	Not Active		
			Message $18C	≥ 10.00 seconds				
			Message $18D	≥ 10.00 seconds	Ignition Voltage Criteria:			
			Message $1C2	≥ 10.00 seconds	Ignition voltage	>= 9.50		
			Message $283	≥ 10.00 seconds				
			Message $383	≥ 10.00 seconds	Power Mode	= run		
			Message $489	≥ 10.00 seconds	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		
					U1818	Not Active on Current Key		

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		

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 has stopped sending messages on 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.	Message is not received from controller for		General Enable Criteria:		See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0074	Not Active on Current Key Cycle		
			Message $18D	≥ 10.0 seconds				
					Normal CAN transmission on Bus B			
			Message $1D8	≥ 0.5 seconds		Enabled		
			Message $3C5	≥ 10.0 seconds	Device Control	Not Active		
			Message $3D5	≥ 10.0 seconds	High Voltage Virtual Network Management	Not Active		
			Message $3D7	≥ 10.0 seconds				
					Ignition Voltage Criteria:			
			Message $3DA	≥ 10.0 seconds				
					Ignition voltage	>= 9.50		
			Message $3DB	≥ 10.0 seconds				
					Power Mode	= run		
			Message $3DF	≥ 10.0 seconds				
					Off Cycle Enable Criteria:			
					Enable Calibration is True	= 1 (1 indicates 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	> 3.0000 seconds		
					Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for	> 0.4000 seconds		
					U182D			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Not Active on Current Key Cycle		
					Hybrid Powertrain Control Module B (VICM)	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 on Bus E	U1833	This diagnostic detects that the Brake System Control Module has stopped sending messages on Bus E. If Brake System Control Module message traffic is not received on Bus E by the host controller in the indicated time the DTC is set.	Message is not received from controller for Message $0C1 Rdnt Message $0C5 Rdnt Message $235	 ≥ 10.00 seconds ≥ 10.00 seconds ≥ 0.50 seconds	General Enable Criteria: U0077 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 U1833	 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	See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips

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		

Initial Supporting table - Clutch1FailSlipSpeed

Description:

y/x	-50	-30	-24	-17	4	40
1	20	20	20	20	30	30

Initial Supporting table - Clutch1ProfiledSlipSpdThd

Description:

y/x	-50	-30	-24	-17	4	40
1	250	250	250	250	175	120

Initial Supporting table - Clutch2FailSlipSpeed

Description:

y/x	-50	-30	-24	-17	4	40
1	20	20	20	20	30	30

Initial Supporting table - Clutch2ProfiledSlipSpeedThd

Description:

y/x	-50	-30	-24	-17	4	40
1	350	350	350	350	350	250

Initial Supporting table - Cold Soak Rationality

Description: Transmission Temp Difference from Cold Soak Average Temperature Based on Transmission Fluid Temperature

y/x	1	2	3	4	5
1	-40	-20	0	20	60
2	15	10	10	10	10

Initial Supporting table - P2797 Pump Performance Speed Delta Threshold

Description:

y/x	-40	-30	-15	50	90	125
1	67	100	500	500	500	500

Initial Supporting table - P2797 Pump Performance Speed Delta Threshold Case 2

Description:

y/x	-40	-30	-15	50	90	125
1	1,000	900	800	700	600	500

Initial Supporting table - TapDownFail1Range

Description:

TapDownFail1Range - Part 1

y/x	CeTRGR_e_Drive1	CeTRGR_e_Drive2	CeTRGR_e_Drive3	CeTRGR_e_Drive4
1	0	0	0	0

TapDownFail1Range - Part 2

y/x	CeTRGR_e_Drive5	CeTRGR_e_Drive6	CeTRGR_e_Drive7	CeTRGR_e_Drive8
1	0	0	0	0

TapDownFail1Range - Part 3

y/x	CeTRGR_e_Neutral	CeTRGR_e_Reverse	CeTRGR_e_Park	
1	1	0	1	

Initial Supporting table - TapDownFail2Range

Description:

TapDownFail2Range - Part 1

y/x	CeTRGR_e_Drive1	CeTRGR_e_Drive2	CeTRGR_e_Drive3	CeTRGR_e_Drive4
1	1	1	1	1

TapDownFail2Range - Part 2

y/x	CeTRGR_e_Drive5	CeTRGR_e_Drive6	CeTRGR_e_Drive7	CeTRGR_e_Drive8
1	1	1	1	1

TapDownFail2Range - Part 3

y/x	CeTRGR_e_Neutral	CeTRGR_e_Reverse	CeTRGR_e_Park	
1	0	0	0	

Initial Supporting table - TapUpFail1Range

Description:

TapUpFail1Range - Part 1

y/x	CeTRGR_e_Drive1	CeTRGR_e_Drive2	CeTRGR_e_Drive3	CeTRGR_e_Drive4
1	0	0	0	0

TapUpFail1Range - Part 2

y/x	CeTRGR_e_Drive5	CeTRGR_e_Drive6	CeTRGR_e_Drive7	CeTRGR_e_Drive8
1	0	0	0	0

TapUpFail1Range - Part 3

y/x	CeTRGR_e_Neutral	CeTRGR_e_Reverse	CeTRGR_e_Park	
1	1	0	1	

Initial Supporting table - TapUpFail2Range

Description:

TapUpFail2Range - Part 1

y/x	CeTRGR_e_Drive1	CeTRGR_e_Drive2	CeTRGR_e_Drive3	CeTRGR_e_Drive4
1	1	1	1	1

TapUpFail2Range - Part 2

y/x	CeTRGR_e_Drive5	CeTRGR_e_Drive6	CeTRGR_e_Drive7	CeTRGR_e_Drive8
1	1	1	1	1

TapUpFail2Range - Part 3

y/x	CeTRGR_e_Neutral	CeTRGR_e_Reverse	CeTRGR_e_Park	
1	0	0	0	

17 OBDG02 Hybrid Powertrain Control Processor 2 (HPC2 - BSM) Summary Tables

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	≤ 10.20 volts	Engine Speed	>= 0 rpm	0 ms	Type C, No SVS

17 OBDG02 Hybrid Powertrain Control Processor 2 (HPC2 - BSM) Summary Tables

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	

17 OBDG02 Hybrid Powertrain Control Processor 2 (HPC2 - BSM) Summary Tables

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 1 Circuit	P0641	Sets when the 5 Volt Reference 1 Circuit voltage is below a threshold or if it is above a threshold	5v Reference 1 circuit Voltage	<= 4.496 V (10% of nominal) OR >= 5.494 V (10% of nominal)	Diagnostic Enabled Battery Voltage	= TRUE >= 10.20 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 2 Circuit	P0651	Sets when the 5 Volt Reference 2 Circuit voltage is below a threshold or if it is above a threshold	5v Reference 2 circuit Voltage	<= 4.496 V (10% of nominal) OR >= 5.494 V (10% of nominal)	Diagnostic Enabled Battery Voltage	= TRUE >= 10.20 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 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 >= 10.20 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 >= 10.20 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.
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 >= 10.20 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.
High Voltage System Interlock Circuit Low	P0A0C	The diagnostic monitors the sensed interlock voltage for values that are below a threshold when the HVIL circuit is commanded to 5 volts	HVIL Sensed % of 5 volts	< 30 %	HVIL Commanded Status 12V Battery Voltage	= 5V > 10.2 V	2 failures out of 2 samples 12.5 ms /sample 25 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Voltage System Interlock Circuit High	P0A0D	The diagnostic monitors the sensed interlock voltage for values that are above a threshold. The threshold is different depending upon when the HVIL circuit is commanded to 5 volts or 0 volts.	HVIL Sensed % of 5 volts	> 24 %	HVIL Commanded Status 12V Battery Voltage	= 0V > 10.2 V	5 failures out of 8 samples 12.5 ms /sample 100 ms	Type A, 1 Trips
			HVIL Sensed % of 5 volts	> 44 %	HVIL Commanded Status 12V Battery Voltage	= 5V > 10.2 V	4 failures out of 6 samples 12.5 ms /sample 75 ms	

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)		80.00 fails / 100.00 samples at 100ms	Type A, 1 Trips
					Short High	P0A9E P0AC8 P0ACD P0AEB P0BC5 P0C36 P0C7F P0C84 P0C8B P0C90 P0C95 P0C9A P0CAB P0CB0 P0CB5 P0CBA		
					Short Low	P0A9D P0AC7 P0ACC P0AEA P0BC4 P0C35 P0C7E P0C83 P0C8A P0C8F P0C94 P0C99 P0CAA P0CAF P0CB4 P0CB9		
					Performance	P1E8E P1E94 P1E9A P1EA0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P1FBD P1FBE P1FBF P1FC0		
					Comunication	U179C		
							10 seconds	

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 ~ 35 % 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 ~ 35 % point, the failure threshold is reduced proportionally with decreasing SOC from the ~ 35 % point. Above the ~ 35 % 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	10 failures 100 ms /sample	Type B, 2 Trips
					Hybrid/EV Battery SOC	> 35.00 %, AND < 100.00 %		
					Run Crank Active	= TRUE		
					System Voltage	> 10.20 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 Hybrid/EV battery SOC Run Crank Active System Voltage No Active DTCs Actual battery power	< 50.00 ºC, AND > -10.00 ºC > 0.00 %, AND < 60.00 % = TRUE > 10.20 V 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) < 80.00 %-Sec	10 failures 100 ms /sample	

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	> 35.00 %, AND < 100.00 %		
					Run Crank Transition	True -> False		
					No failure of the discharging power limit monitor during this drive cycle			
					System Voltage	> 10.20 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	> 10.20 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 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	> 10.20 V 11.00 % < Pulse Width Modulation Duty Cycle < 89.00 %	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	> 10.20 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	> 10.20 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	> 10.20 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	> 30 Volts	Propulsion Bus Voltage Sensor Propulsion Positive Bus Voltage High Voltage Battery Voltage Sensor [All Contactors OR [All Contactors AND Propulsion Bus Voltage]]	Not Failed Not Failed Not Failed Open for > 120 seconds Open < 9 % 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 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	> 30 V	Propulsion Bus Voltage Sensor Propulsion Negative Bus Voltage High Voltage Battery Voltage Sensor All Contactors OR [All Contactors AND Propulsion Bus Voltage]	Not Failed Not Failed Not Failed Open for > 120 seconds Open < 9 % 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	< 200,000 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	< 250,000 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	> 416 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	> 10.20 V	8 failures out of 10 samples 25 ms /sample 250 ms	Type A, 1 Trips

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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	> 10.20 V	8 failures out of 10 samples 25 ms /sample 250 ms	Type A, 1 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	> 10.20 V	8 failures out of 10 samples 25 ms /sample 250 s	Type A, 1 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	> 10.20 V	8 failures out of 10 samples 25 ms /sample 250 ms	Type A, 1 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.2 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	> 10.2 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 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	> 10.2 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	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	> 10.2 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	> 10.2 V < 999 amps ON	13 failures out of 16 samples 12.5 ms /sample 200 ms	Type B, 2 Trips

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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	> 10.2 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	> 10.2 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	> 10.2 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	> 10.2 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 Trips

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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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 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 A, 1 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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Y Circuit	P0BB3	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Y Circuit Range/ Performance	P0BB4	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Y Circuit Low	P0BB5	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Y Circuit High	P0BB6	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Z Circuit	P0BB8	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Z Circuit Range/ Performance	P0BB9	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Z Circuit Low	P0BBA	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense Z Circuit High	P0BBB	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor E Range/ Performance	P0BC3	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 E Circuit Low	P0BC4	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	> 10.20 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 E Circuit High	P0BC5	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	> 10.20 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 E Circuit Intermittent/ Erratic	P0BC6	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	> 10.20 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 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:	> 10.20 V = TRUE 11.00 % < Pulse Width Modulation Duty Cycle < 89.00 % > 11.00 seconds P0A81, P0A84, P0A85, P0D64, P0D65, P0D66, P0BC9, P0BCA, P0A9C, P0A9D and P0A9E	Up To 43s	Type B, 2 Trips
			Fan feedback performance fail in non-actuated state Fan speed feedback RPM	> 120.00	System Voltage Cooling Fan Enable Fan OFF Time Fan feedback performance fail in actuated state	> 10.20 V = FALSE > 20.00 seconds = FALSE	24.00 fails / 32.00 samples at 250ms 8 seconds	
			Fan feedback performance fail in actuated state Filtered (command speed - feedback speed) AND Filtered (command speed - feedback speed)	> **Fan Feedback Repass Low Threshold** < **Fan Feedback Repass High Threshold**	System Voltage Cooling Fan Enable Fan Control Commanded Speed Fan ON time No active DTCs:	> 10.20 V = TRUE 11.00 % <Pulse Width Modulation Duty Cycle< 89.00 % > 11.00 seconds P0A81, P0A84, P0A85, P0D64, P0D65, P0D66, P0BC9, P0BCA, P0A9C, P0A9D and P0A9E	Up To 42.5s	

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	< 8.00 Hz	System Voltage Cooling Fan Enable Fan control commanded speed Fan ON Time	> 10.20 V = TRUE 11.00 % < Pulse Width Modulation Duty Cycle < 89.00 % > 8.00 seconds	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	> 290.00 HZ	System Voltage Cooling Fan Enable Fan control commanded speed Fan ON Time	> 10.20 V = TRUE 11.00 % < Pulse Width Modulation DC< 89.00 % > 8.00 seconds	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 F Range/ Performance	P0C34	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 F Circuit Low	P0C35	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	> 10.20 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 F Circuit High	P0C36	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	> 10.20 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 F Circuit Intermittent/ Erratic	P0C37	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	> 10.20 V U179C	4 failures out of 5 samples 100 ms /sample 500 ms	Type B, 2 Trips

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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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor G Range/ Performance	P0C7D	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 G Circuit Low	P0C7E	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	> 10.20 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 G Circuit High	P0C7F	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor G Circuit Intermittent/ Erratic	P0C80	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	> 10.20 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 H Range/ Performance	P0C82	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 H Circuit Low	P0C83	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type B, 2 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Temperature Sensor H Circuit High	P0C84	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	> 10.20 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 H Circuit Intermittent/ Erratic	P0C85	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	> 10.20 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 I Range/ Performance	P0C89	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 I Circuit Low	P0C8A	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	> 10.20 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 I Circuit High	P0C8B	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	> 10.20 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 I Circuit Intermittent/ Erratic	P0C8C	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	> 10.20 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 J Range/ Performance	P0C8E	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 J Circuit Low	P0C8F	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	> 10.20 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 J Circuit High	P0C90	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	> 10.20 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 J Circuit Intermittent/ Erratic	P0C91	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	> 10.20 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 K Range/ Performance	P0C93	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 K Circuit Low	P0C94	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	> 10.20 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 K Circuit High	P0C95	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	> 10.20 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 K Circuit Intermittent/ Erratic	P0C96	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	> 10.20 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 L Range/ Performance	P0C98	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 L Circuit Low	P0C99	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	> 10.20 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 L Circuit High	P0C9A	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	> 10.20 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 L Circuit Intermittent/ Erratic	P0C9B	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	> 10.20 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 M Range/ Performance	P0CA9	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 M Circuit Low	P0CAA	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	> 10.20 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 M Circuit High	P0CAB	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	> 10.20 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 M Circuit Intermittent/ Erratic	P0CAC	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	> 10.20 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 N Range/ Performance	P0CAE	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 N Circuit Low	P0CAF	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	> 10.20 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 N Circuit High	P0CB0	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	> 10.20 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 N Circuit Intermittent/ Erratic	P0CB1	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	> 10.20 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 O Range/ Performance	P0CB3	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 O Circuit Low	P0CB4	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	> 10.20 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 O Circuit High	P0CB5	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	> 10.20 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 O Circuit Intermittent/ Erratic	P0CB6	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	> 10.20 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 P Range/ Performance	P0CB8	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 P Circuit Low	P0CB9	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	> 10.20 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 P Circuit High	P0CBA	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	> 10.20 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 P Circuit Intermittent/ Erratic	P0CBB	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	> 10.20 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/EV Electronics Coolant Pump Control Circuit High	P0CEC	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.	Coolant Pump Control Voltage	> 9 V	System Voltage Coolant Pump Enable Coolant Pump Control Pulse Width Modulation (PWM) Range	> 10.20 V = True 0.00 % < PWM Duty Cycle < 10.00 %	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	P0CED	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.	Coolant Pump Enable Voltage	>=1.14 V and <= 2.81 V	System Voltage Coolant Pump Enable	> 10.20 V = True	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)	> 21.00 °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: No active power electronic pump DTCs: No active propulsion system off timer DTC: Power mode Test complete this trip Compressor running Propulsion Off Timer Power Electronic Pump transition soak time Minimum PE pump commanded threshold Compressor transition soak time Outside Air Temperature	> 10.20 V P0CF0, P0CF1, P0CF2 P0071, P0072, P0073, P0074 P0711, P0712, P0713 P1F44, P1F45, P0CE9 P0606 = Run for < 13.00 s = FALSE = FALSE > 21,600.00 s > 3,600.00 s < 100.00 % > 3,600.00 s >= -40.00 °C	32.00 fails / 40.00 samples at 250ms 10 sec	Type B, 2 Trips

17 OBDG02 Hybrid Powertrain Control Processor 2 (HPC2 - BSM) Summary Tables

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 voltage 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 voltage	< 2.00 % (0.10 V) of reference voltage	System Voltage	> 10.20 V	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 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 voltage 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 voltage	> 98.00 % (4.90 V) of reference voltage	System Voltage	> 10.20 V	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 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 4 consecutive temperature sensor samples at 250ms	System Voltage	> 10.20 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.
Hybrid Battery Pack Cooling Fan 1 Enable Circuit Open	P0D64	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.	Enable Circuit Voltage	>=1.14 V and <= 2.81 V	System Voltage Cooling Fan Enable	> 10.20 V = FALSE	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 Enable Circuit Low	P0D65	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.	Enable Circuit Voltage	< 5.35 V	System Voltage Cooling Fan Enable	> 10.20 V = TRUE	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 Enable Circuit High	P0D66	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.	Enable Circuit Voltage	>=5.27 V and <= 19.7 V	System Voltage Cooling Fan Enable	> 10.20 V = FALSE	16.00 fails / 20.00 samples at 250ms 5 seconds	Type B, 2 Trips

17 OBDG02 Hybrid Powertrain Control Processor 2 (HPC2 - BSM) Summary Tables

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	> 770.00 Hz	System Voltage Coolant Pump Enable Pump control commanded speed Pump ON time	> 10.20 V = True 11.00 % < Pulse Width Modulation Duty Cycle < 89.00 % > 5.00 seconds	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	< 8.00 Hz	System Voltage Coolant Pump Enable Pump control commanded speed Pump ON time	> 10.20 V = True 11.00 % < Pulse Width Modulation Duty Cycle < 89.00 % > 5.00 seconds	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)	 < **PCOD Pump Feedback Fault Low Threshold** > **PCOD Pump Feedback Fault High Threshold**	System Voltage Coolant Pump Enable No active power electronic coolant temperature DTCs: No active power electronic pump DTCs: Pump control commanded speed Pump ON time Power electronic temperature	> 10.20 V = True P0CF0, P0CF1, P0CF2 P0CEF, P0CE9, P1F44, P1F45 11.00 % < Pulse Width Modulation Duty Cycle < 89.00 % > 10.00 seconds -20.00 < °C < 9,999.00	up to 57 seconds	Type B, 2 Trips
			Pump feedback performance fail in non-actuated state Pump speed feedback RPM	 > 50.00	System Voltage Coolant Pump Enable Pump OFF time Pump feedback performance fail in actuated state	> 10.20 V = False > 10.00 seconds = FALSE	32.00 fails / 40.00 samples at 250ms 10 sec	
			If the pump feedback diagnostic fails the actuated state Filtered (command speed - feedback speed) AND	 > **PCOD Pump Feedback Repass Low Threshold**	System Voltage Coolant Pump Enable No active power electronic coolant temperature DTCs: No active power	> 10.20 V = True P0CF0, P0CF1, P0CF2 P0CEF	up to 57 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Filtered (command speed - feedback speed)	< **PCOD Pump Feedback Repass High Threshold**	electronic pump DTCs:	P0CE9, P1F44, P1F45		
					Pump control commanded speed	11.00 % < Pulse Width Modulation Duty Cycle < 89.00 %		
					Pump ON time	> 10.00 seconds		
					Power electronic temperature	-20.00 < °C < 9,999.00		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AA Circuit Range/ Performance	P1B16	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AA Circuit Low	P1B17	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AA Circuit High	P1B18	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AB Circuit Range/ Performance	P1B19	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AB Circuit Low	P1B1A	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AB Circuit High	P1B1B	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AC Circuit Range/ Performance	P1B1C	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AC Circuit Low	P1B1D	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AC Circuit High	P1B1E	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AD Circuit Range/ Performance	P1B1F	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AD Circuit Low	P1B20	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AD Circuit High	P1B21	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AE Circuit Range/ Performance	P1B22	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AE Circuit Low	P1B23	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AE Circuit High	P1B24	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AF Circuit Range/ Performance	P1B25	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AF Circuit Low	P1B26	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AF Circuit High	P1B27	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AA Circuit	P1B28	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AB Circuit	P1B29	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AC Circuit	P1B2A	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AD Circuit	P1B2B	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AE Circuit	P1B2C	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AF Circuit	P1B2D	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AG Circuit Range/ Performance	P1B45	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 A, 1 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 AG Circuit Low	P1B46	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AG Circuit High	P1B47	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AH Circuit Range/ Performance	P1B48	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AH Circuit Low	P1B49	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AH Circuit High	P1B4A	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AI Circuit Range/ Performance	P1B4B	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AI Circuit Low	P1B4C	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AI Circuit High	P1B4D	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AJ Circuit Range/ Performance	P1B4E	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AJ Circuit Low	P1B4F	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AJ Circuit High	P1B50	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AK Circuit Range/ Performance	P1B51	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AK Circuit Low	P1B52	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AK Circuit High	P1B53	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AL Circuit Range/ Performance	P1B54	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AL Circuit Low	P1B55	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AL Circuit High	P1B56	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AM Circuit Range/ Performance	P1B57	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AM Circuit Low	P1B58	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AM Circuit High	P1B59	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AN Circuit Range/ Performance	P1B5A	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AN Circuit Low	P1B5B	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AN Circuit High	P1B5C	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AO Circuit Range/ Performance	P1B5D	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AO Circuit Low	P1B5E	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AO Circuit High	P1B5F	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AP Circuit Range/ Performance	P1B60	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 A, 1 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 AP Circuit Low	P1B61	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AP Circuit High	P1B62	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AQ Circuit Range/ Performance	P1B63	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AQ Circuit Low	P1B64	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AQ Circuit High	P1B65	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AR Circuit Range/ Performance	P1B66	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AR Circuit Low	P1B67	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AR Circuit High	P1B68	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AS Circuit Range/ Performance	P1B69	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AS Circuit Low	P1B6A	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AS Circuit High	P1B6B	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AT Circuit Range/ Performance	P1B6C	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AT Circuit Low	P1B6D	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AT Circuit High	P1B6E	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AU Circuit Range/ Performance	P1B6F	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AU Circuit Low	P1B70	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AU Circuit High	P1B71	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AV Circuit Range/ Performance	P1B72	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 A, 1 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 AV Circuit Low	P1B73	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AV Circuit High	P1B74	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AW Circuit Range/ Performance	P1B75	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AW Circuit Low	P1B76	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AW Circuit High	P1B77	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AX Circuit Range/ Performance	P1B78	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AX Circuit Low	P1B79	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AX Circuit High	P1B7A	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AY Circuit Range/ Performance	P1B7B	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 A, 1 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 AY Circuit Low	P1B7C	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AY Circuit High	P1B7D	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AZ Circuit Range/ Performance	P1B7E	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AZ Circuit Low	P1B7F	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AZ Circuit High	P1B80	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BA Circuit Range/ Performance	P1B81	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BA Circuit Low	P1B82	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BA Circuit High	P1B83	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BB Circuit Range/ Performance	P1B84	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BB Circuit Low	P1B85	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BB Circuit High	P1B86	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BC Circuit Range/ Performance	P1B87	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BC Circuit Low	P1B88	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BC Circuit High	P1B89	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BD Circuit Range/ Performance	P1B8A	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BD Circuit Low	P1B8B	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BD Circuit High	P1B8C	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BE Circuit Range/ Performance	P1B8D	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BE Circuit Low	P1B8E	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BE Circuit High	P1B8F	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BF Circuit Range/ Performance	P1B90	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BF Circuit Low	P1B91	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BF Circuit High	P1B92	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BG Circuit Range/ Performance	P1B93	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BG Circuit Low	P1B94	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BG Circuit High	P1B95	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BH Circuit Range/ Performance	P1B96	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BH Circuit Low	P1B97	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BH Circuit High	P1B98	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BI Circuit Range/ Performance	P1B99	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BI Circuit Low	P1B9A	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BI Circuit High	P1B9B	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BJ Circuit Range/ Performance	P1B9C	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BJ Circuit Low	P1B9D	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BJ Circuit High	P1B9E	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BK Circuit Range/ Performance	P1B9F	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BK Circuit Low	P1BA0	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BK Circuit High	P1BA1	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BL Circuit Range/ Performance	P1BA2	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 A, 1 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 BL Circuit Low	P1BA3	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BL Circuit High	P1BA4	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BM Circuit Range/ Performance	P1BA5	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BM Circuit Low	P1BA6	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BM Circuit High	P1BA7	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BN Circuit Range/ Performance	P1BA8	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BN Circuit Low	P1BA9	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BN Circuit High	P1BAA	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BO Circuit Range/ Performance	P1BAB	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BO Circuit Low	P1BAC	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BO Circuit High	P1BAD	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BP Circuit Range/ Performance	P1BAE	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BP Circuit Low	P1BAF	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BP Circuit High	P1BB0	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BQ Circuit Range/ Performance	P1BB1	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 A, 1 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 BQ Circuit Low	P1BB2	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BQ Circuit High	P1BB3	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BR Circuit Range/ Performance	P1BB4	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 A, 1 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 BR Circuit Low	P1BB5	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BR Circuit High	P1BB6	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BS Circuit Range/ Performance	P1BB7	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BS Circuit Low	P1BB8	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BS Circuit High	P1BB9	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BT Circuit Range/ Performance	P1BBA	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BT Circuit Low	P1BBB	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BT Circuit High	P1BBC	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BU Circuit Range/ Performance	P1BBD	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BU Circuit Low	P1BBE	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BU Circuit High	P1BBF	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BV Circuit Range/ Performance	P1BC0	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BV Circuit Low	P1BC1	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BV Circuit High	P1BC2	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BW Circuit Range/ Performance	P1BC3	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BW Circuit Low	P1BC4	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BW Circuit High	P1BC5	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BX Circuit Range/ Performance	P1BC6	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BX Circuit Low	P1BC7	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BX Circuit High	P1BC8	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BY Circuit Range/ Performance	P1BC9	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 A, 1 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BY Circuit Low	P1BCA	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BY Circuit High	P1BCB	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BZ Circuit Range/ Performance	P1BCC	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BZ Circuit Low	P1BCD	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BZ Circuit High	P1BCE	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CA Circuit Range/ Performance	P1BCF	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CA Circuit Low	P1BD0	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CA Circuit High	P1BD1	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CB Circuit Range/ Performance	P1BD2	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CB Circuit Low	P1BD3	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CB Circuit High	P1BD4	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	> 10.20 V Cell Voltage Circuit Open (see Fault Bundle page) U179C	14 failures out of 18 samples 100 ms /sample 1.8 s	Type A, 1 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	> 416 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 Sense AG Circuit	P1E4C	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AH Circuit	P1E4D	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AI Circuit	P1E4E	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AJ Circuit	P1E4F	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AK Circuit	P1E50	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AL Circuit	P1E51	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AM Circuit	P1E52	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AN Circuit	P1E53	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AO Circuit	P1E54	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AP Circuit	P1E55	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AQ Circuit	P1E56	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AR Circuit	P1E57	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AS Circuit	P1E58	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AT Circuit	P1E59	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AU Circuit	P1E5A	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AV Circuit	P1E5B	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AW Circuit	P1E5C	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AX Circuit	P1E5D	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AY Circuit	P1E5E	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense AZ Circuit	P1E5F	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BA Circuit	P1E60	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BB Circuit	P1E61	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BC Circuit	P1E62	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BD Circuit	P1E63	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BE Circuit	P1E64	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BF Circuit	P1E65	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BG Circuit	P1E66	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BH Circuit	P1E67	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BI Circuit	P1E68	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BJ Circuit	P1E69	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BK Circuit	P1E6A	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BL Circuit	P1E6B	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BM Circuit	P1E6C	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BN Circuit	P1E6D	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BO Circuit	P1E6E	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BP Circuit	P1E6F	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BQ Circuit	P1E70	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BR Circuit	P1E71	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BS Circuit	P1E72	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BT Circuit	P1E73	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BU Circuit	P1E74	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BV Circuit	P1E75	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BW Circuit	P1E76	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BX Circuit	P1E77	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BY Circuit	P1E78	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense BZ Circuit	P1E79	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CA Circuit	P1E7A	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Hybrid Battery Voltage Sense CB Circuit	P1E7B	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	> 10.20 V U179C	7 failures out of 9 samples 100 ms /sample 900 ms	Type A, 1 Trips

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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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 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 C Performance	P1E9A	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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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 C Cell Balancing Circuit	P1E9E	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	> 10.20 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

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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 C Reference Voltage	P1E9F	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 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 D Performance	P1EA0	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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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 D Cell Balancing Circuit	P1EA4	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	> 10.20 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 D Reference Voltage	P1EA5	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 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) > 10.20 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	> 162 V > 10.20 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 > 162 V > 10.20 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 A, 1 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	> 10.20 V Open Open P0AC2 P0AC1	200 ms	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 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 > 10.2 V	6 failures out of 6 samples 12.5 ms /sample 75 ms	Type A, 1 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	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.	
			DTC Clear	Must Send CPID	0x7E4 07 AE 32 01 01			

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.	Coolant Pump Enable Voltage	< 5.35 V	System Voltage Coolant Pump Enable	> 10.20 V = True	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.	Coolant Pump Enable Voltage	>=5.27 V and <= 19.7 V	System Voltage Coolant Pump Enable	> 10.20 V = False	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 Battery Interface Control Module E Performance	P1FBD	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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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/EV Battery Interface Control Module F Performance	P1FBE	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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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/EV Battery Interface Control Module G Performance	P1FBF	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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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/EV Battery Interface Control Module H Performance	P1FC0	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	> 10.20 V True -> False, OR False -> True U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips
			ADC digital output when analog input is saturated high	< 4.93 V	System Voltage Run Crank transition No Active DTCs	> 10.20 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	> 10.20 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	> 10.20 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.						

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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 E Reference Voltage	P1FC3	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module F Reference Voltage	P1FC4	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips

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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 G Reference Voltage	P1FC5	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module H Reference Voltage	P1FC6	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module E Cell Balancing Circuit	P1FC9	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	> 10.20 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 F Cell Balancing Circuit	P1FCA	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	> 10.20 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 G Cell Balancing Circuit	P1FCB	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	> 10.20 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 H Cell Balancing Circuit	P1FCC	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	> 10.20 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 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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module C Voltage Sensor Circuit Low	P1FD7	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips

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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 D Voltage Sensor Circuit Low	P1FD8	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module E Voltage Sensor Circuit Low	P1FD9	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module F Voltage Sensor Circuit Low	P1FDA	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips

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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 G Voltage Sensor Circuit Low	P1FDB	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module H Voltage Sensor Circuit Low	P1FDC	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips

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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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module C Voltage Sensor Circuit High	P1FE1	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module D Voltage Sensor Circuit High	P1FE2	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module E Voltage Sensor Circuit High	P1FE3	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	Type A, 1 Trips

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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 F Voltage Sensor Circuit High	P1FE4	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module G Voltage Sensor Circuit High	P1FE5	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 Battery Interface Control Module H Voltage Sensor Circuit High	P1FE6	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	> 10.20 V U179C	8 failures out of 10 samples 100 ms /sample 1 s	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 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	> 10.20 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 A, 1 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	> 10.20 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 A, 1 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 C Voltage Sensor Circuit Range/ Performance	P1FEB	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	> 10.20 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 A, 1 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 D Voltage Sensor Circuit Range/ Performance	P1FEC	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	> 10.20 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 A, 1 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 E Voltage Sensor Circuit Range/ Performance	P1FED	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	> 10.20 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 A, 1 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 F Voltage Sensor Circuit Range/ Performance	P1FEE	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	> 10.20 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 A, 1 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 G Voltage Sensor Circuit Range/ Performance	P1FEF	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	> 10.20 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 A, 1 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 H Voltage Sensor Circuit Range/ Performance	P1FF0	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	> 10.20 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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Wake-up Circuit Open	P24EF	Detects an open circuit fault in the Control Module Output Wake-Up Circuit	Control Voltage	2.82 <= V <= 7.04	Diagnostic Enabled Command Status	= TRUE = Off	480 failed samples within 560 samples 1 sample every 12.5ms 7000 ms	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 Wake-up Circuit Low	P24F0	Detects a fault in the Control Module Output Wake-Up Circuit Low	Control Voltage	<= 5.52 V	Diagnostic Enabled Command Status	= TRUE = On	480 failed samples within 560 samples 1 sample every 12.5ms 7000 ms	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 Wake-up Circuit High	P24F1	Detects a fault in the Control Module Output Wake-Up Circuit High	Control Voltage	>= 13.21 V	Diagnostic Enabled Command Status	= TRUE = Off	480 failed samples within 560 samples 1 sample every 12.5ms 7000 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 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.
Ignition Switch Accessory Position Circuit Low	P2537	Detects an accessory circuit open	Accessory	= False	P2537	Not Test Failed This Key On and Not Test Passed This Key On	0.1 seconds (8 * 0.0125)	Type B, 2 Trips
					Propulsion System	Active		
					Propulsion System Active Time	> 0.5 seconds		

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	> 12.00 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.
Exhaust Heat Exchanger Exhaust Bypass Valve Position Sensor Performance	P3064	This performance diagnostic detects if the valve does not function properly. If the enable criteria are met then the intrusive range-of-motion test is enabled. The valve is commanded to move from end position to end position. If the valve range of motion (end position to end position) is within a calibratable margin, then a PASS is reported. If the valve range of motion is outside the acceptable margin after a calibratable number of retries, then a FAIL is reported.	(Observed range of valve motion during the intrusive range-of-motion test OR Observed range of valve motion during the intrusive range-of-motion test) FOR Number of consecutive intrusive range-of-motion tests	< (52 - 13) counts > (52 + 13) counts = 3	System Voltage Engine speed Time since last command change (ABS(valve position - commanded position) OR Valve was not moved from Collect to Bypass on the previous shutdown)	> 10.20 V > 500.00 rpm for > 5.0 sec > 2.0 sec > 13 counts for 20 or more out of 25 samples at 100 ms	63 sec	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 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 >= 10.20 V <= 10.20 V >= 11.00 V >= 5,000 ms	5 failures out of 5 samples 1 s loop	Type B, 2 Trips

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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 >= 10.20 V <= 10.20 V >= 11.00 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 >= 10.20 V <= 10.20 V >= 11.00 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 Brake System Control Module	U0129	Detects that CAN serial data communication has been lost with the Brake System Control Module on Bus A	Messages have not been received from the EBCM 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 >= 10.20 V <= 10.20 V >= 11.00 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 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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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 C	U01A2	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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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 D	U01A3	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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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 E	U01A4	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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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 F	U01A5	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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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 G	U01A6	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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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.						

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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 H	U01A7	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	> 10.20 V U179C	5 seconds	Type A, 1 Trips
			(DTC Pass) Instrusive test performed upon failure of DTC U179C can re-establish communication with this BICM		System Voltage Active DTCs	> 10.20 V U179C	100 ms	
			(DTC Pass) U179C Pass		System Voltage	> 10.20 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 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 >= 10.20 V <= 10.20 V >= 11.00 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 Exhaust Heat Exchanger Bypass Valve Actuator	U063E	Detects that LIN serial data communication has been lost with Exhaust Heat Exchanger Bypass Valve Actuator	Response not received counter	>= 80	Controller On Run/Crank LIN Communication Enabled Time (Battery Voltage OR Battery Voltage transition from to for time required)	= TRUE = TRUE >= 2 sec >= 10.20 V <= 10.20 V >= 11.00 V >= 5,000 ms	80 missed messages @ 40 ms 3.2 sec	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	> 10.20 V	5 seconds	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 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 >= 10.20 V <= 10.20 V >= 11.00 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 >= 10.20 V <= 10.20 V >= 11.00 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.
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 A, 1 Trips

Initial Supporting table - Fan Feedback Fault high Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	89
1	325	325	455	694	942	1,187	1,431	1,684	1,940	2,148

Initial Supporting table - Fan Feedback Fault low Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	89
1	-400	-400	-450	-500	-600	-700	-800	-900	-1,000	-1,100

Initial Supporting table - Fan Feedback Repass High Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	89
1	260	260	364	555	754	950	1,145	1,347	1,552	1,718

Initial Supporting table - Fan Feedback Repass Low Threshold

Description:

y/x	10	11	20	30	40	50	60	70	80	89
1	-320	-320	-360	-400	-480	-560	-640	-720	-800	-880

Initial Supporting table - KtBSED_P_BPD_C_EndOfLifePwrThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	2.07	4.32	9.15	16.35	27.00	27.00	27.00
20	1.59	3.38	7.23	12.89	27.00	27.00	27.00
30	1.45	3.08	6.72	12.15	27.00	27.00	27.00
50	1.19	2.61	5.74	10.34	22.62	27.00	27.00
70	0.82	1.82	4.02	7.24	15.81	23.00	25.04
80	0.59	1.32	2.92	5.26	11.52	16.51	17.80
90	0.33	0.73	1.63	2.96	6.52	9.31	10.05

Initial Supporting table - KtBSED_P_BPD_C_MinPassPowerThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	2.07	4.32	9.15	16.35	27.00	27.00	27.00
20	1.59	3.38	7.23	12.89	27.00	27.00	27.00
30	1.45	3.08	6.72	12.15	27.00	27.00	27.00
50	1.19	2.61	5.74	10.34	22.62	27.00	27.00
70	0.82	1.82	4.02	7.24	15.81	23.00	25.04
80	0.59	1.32	2.92	5.26	11.52	16.51	17.80
90	0.33	0.73	1.63	2.96	6.52	9.31	10.05

Initial Supporting table - KtBSED_P_BPD_D_EndOfLifePwrThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	-1.85	-3.13	-5.67	-8.92	-14.73	-24.84	-25.00
20	-2.19	-3.88	-7.23	-12.04	-21.66	-25.00	-25.00
30	-2.34	-4.27	-8.13	-13.67	-25.00	-25.00	-25.00
50	-2.59	-4.90	-9.42	-15.88	-25.00	-25.00	-25.00
70	-2.86	-5.47	-10.57	-17.95	-25.00	-25.00	-25.00
80	-3.00	-5.76	-11.12	-19.05	-25.00	-25.00	-25.00
90	-3.12	-5.97	-11.57	-20.04	-25.00	-25.00	-25.00

Initial Supporting table - KtBSED_P_BPD_D_MinPassPowerThrsh

Description:

y/x	-30	-20	-10	0	20	30	50
10	-1.85	-3.13	-5.67	-8.92	-14.73	-24.84	-25.00
20	-2.19	-3.88	-7.23	-12.04	-21.66	-25.00	-25.00
30	-2.34	-4.27	-8.13	-13.67	-25.00	-25.00	-25.00
50	-2.59	-4.90	-9.42	-15.88	-25.00	-25.00	-25.00
70	-2.86	-5.47	-10.57	-17.95	-25.00	-25.00	-25.00
80	-3.00	-5.76	-11.12	-19.05	-25.00	-25.00	-25.00
90	-3.12	-5.97	-11.57	-20.04	-25.00	-25.00	-25.00

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	360.00	360.00	360.00	360.00	360.00	360.00	360.00	360.00	360.00

Initial Supporting table -KtBSED_U_BUV_CellVoltThresh

Description:

y/x	-30	-20	-10	0	10	20	30	40	50
1	1.60	1.60	1.60	1.66	1.66	1.83	1.83	1.83	1.83

Initial Supporting table - KtBSED_U_BUV_PackVoltThresh

Description:

y/x	-30	-20	-10	0	10	20	30	40	50
1	128.49	128.49	128.49	133.62	133.62	146.42	146.42	146.42	146.42

Initial Supporting table - PCOD Pump Feedback Fault High Threshold

Description: Pump Feedback Fault High Threshold

y/x	10	11	20	30	40	50	60	70	80	89
1	354	354	442	749	1,000	1,252	1,507	1,759	2,011	2,263

Initial Supporting table - PCOD Pump Feedback Fault Low Threshold

Description: Pump Feedback Fault Low Threshold

y/x	10	11	20	30	40	50	60	70	80	89
1	-800	-800	-800	-800	-900	-1,000	-1,000	-1,000	-1,000	-1,000

Initial Supporting table - PCOD Pump Feedback Repass High Threshold

Description: Pump Feedback Repass High Threshold

y/x	10	11	20	30	40	50	60	70	80	89
1	283	283	354	599	800	1,002	1,206	1,407	1,609	1,810

Initial Supporting table - PCOD Pump Feedback Repass Low Threshold

Description: Pump Feedback Repass Low Threshold

y/x	10	11	20	30	40	50	60	70	80	89
1	-640	-640	-640	-640	-720	-800	-800	-800	-800	-800

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

17 OBDG02 Motor Control Processor (MCP1A) Summary Tables

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 IGBT power supply circuit voltage. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Scaled 15V IGBT Supply Voltage	< 12.00 V	Wakeup Signal	ON	0.34 seconds out of a 0.42 seconds window (x of y) OR Continuous Fail Time > 0.30 seconds	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 High	P06B2	This diagnostic monitors the IGBT power supply circuit voltage. The sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Scaled 15V IGBT Supply Voltage	> 22.00 V	Wakeup SIgnal	ON	0.34 seconds out of a 0.42 seconds window (x of y) OR Continuous Fail Time > 0.30 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 Performance	P0A1B	This Diagnostic tests all the internal processor subsystems for faults which suggest that the integrity of the processor can not be trusted. Fail Case 1: In case of many faults the MCP microprocessor along with the other 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 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 2, 3, 4, 5, 6:	Inhibit Path Test Failed Indicates that the Processor is not demonstrating the ability to inhibit the system (take remedial action) during the Inhibit Path Test "2ndFailsToTakeRmdlActn "	>= 3 Failures	HV Batt contactor Staus Available Invertor State HV Batt Voltage HV Contactors 12V Batt Voltage Vehicle Speed Motor Faults Motor Speed SRAR Shutdowns SPI Fault RunCrank Active Ram or ROM fault Seed received in wrong order fault Seed/Key Timeout Powermode Off time	= TRUE = Off >= 80.00 V = Closed > 9.50 V < 0.00 kph = FALSE (None active) <= 10.00 rpm = FALSE = FALSE (No active P0606) = FALSE = FALSE (No active P0601, P0604) = FALSE (No active P0606) = FALSE < 5.00 s	Executes in a 12.5ms loop Increment/ Decrement counter = 3	Type A, 1 Trips
			Key Value Indicates that the Processor received incorrect key values for the associated seed values that it sent out to the secondary processor	≠ expected key value	Number Of Mains Processors to monitor IPT status SPI Fault	> 0 = Not Running = FALSE (No active P0606)	Executes in a 12.5ms loop Detects in 150ms or two consecutive faulty keys	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The microprocessors in the TPIM 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. 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 7, 8, 9: These diagnostics are built into the hardware of the MCP microprocessor by the	"2ndRxIncorrectKeys"		Run/Crank Voltage	>= 9.50 V		
			New Seed Update Time Indicates that the Processor did not receive a key value from the secondary processor during the expected time frame "MainDtctdSdKeyTimeout "	> 1.00 sec	Number Of Mains 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 >= 9.50 V > 11 V	Executes in a 12.5ms loop Detects in 1 second	
			Seed sequence Indicates that the Processor received key values in the incorrect order from the secondary processor "MainDtctdSdRxWrongOrdr"	≠ expected order	Number Of Mains Processors to monitor AND SPI Faults AND Run/Crank Voltage OR 12V Battery Voltage	> 0 = FALSE (No active P0606) >= 9.50 V > 11 V	0.15 seconds out of a 0.2 seconds window Executes in a 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"	> 0.20 ms	Seed Update Key Store Fault Enable is true	= 0 (1 is Enabled)	Executes in a 50ms loop after controller initialization	
			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	seed sequence ≠ expected sequence	Program Sequence Watch Enabled (KaPISD_b_ProgSeqWatchEnbl[x])	= TRUE	0.15 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		chip manufacturer. These diagnostics check the ALU and Configuration registers to ensure there have been no changes. The DTC sets if these reigsters 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 10: This diagnostic checks the analog to digital converter (ADC) in the MCP 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 11, 12: These diagnostics use microprocessor internal	Watch "MainSequenceFlt"					
			HWIO detects Fault in ALU Test Indicates that the Processor detected an ALU fault in the processor "MainALU_Flt"	= 2 faults in a key cycle	Enabled Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) AND Run Crank Ingnition Low Voltage AND Run Crank Low Voltage Crank	= 1 (1 is Enabled) = False = True ≠ True ≠ True	Runs continuously in 12.5ms loop	
			HWIO detects Fault in Configuration Registry Test Indicates that the Processor detected a Configuration Register fault in the processor "MainCfgRegFlt"	= 2 faults in a key cycle	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) AND Run Crank Ingnition Low Voltage AND Run Crank Low Voltage Crank	= 1 (1 is Enabled) = False = True ≠ True ≠ True	Runs continuously in 12.5ms loop	
			HWIO detects Fault in the Stack Limit Test Indicates that the CPU Stack memory exceeded the limit "MainStackFlt"	= 2 faults since power up	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False = True	Runs Continuously in 100ms loop	
			voltage diff between real circuit and test circuit Indicates that the	> 16 V	Enable Calibration is True AND Run/Crank Voltage	= 1 (1 is Enabled) >= 7 V	0.15 seconds out of a 0.2 seconds window OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		circuitry to detect there are faults in the RAM or Flash memory. The checks occur at power up and will set the DTC if there are the indicated number of failures in each diagnostic. Fail Case 13: 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.	Processor detected a problem with the Analog to Digital convertor test circuit "MainADC_Flt"		(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	A2D Converter Test Error >= 0.20 seconds	
			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 reset 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle)	
			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 Rest	= 1 (1 is Enabled) = TRUE	Executes once at every power up reset 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle)	
			HWIO detects Fault in Transfer Test from Flash to RAM OR HWIO detects Fault in the Memory Data From Flash	= TRUE = TRUE	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False = True	50ms Execution Rate after controller initialization	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Indicates that the Processor detected a problem in the data transfer from Flash memory to RAM memory "DMA_XferTest"					
			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	Executes at the end of every trip	

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 threshold amount of time, the diagnostic will fail.	Amplitude of Sin or Cos Signal	< 2.3V	Wakeup Signal Resolver Initialization Delay Once Resolver has indicated a fault, a Retry timer is initiated. Retry Timer must be	ON 1.00 s > 0.05 s	Failure Conditions Met for 0.20 to 0.40 seconds out of a 2.00 second window	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 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 threshold amount of time, the diagnostic will fail.	Sin or Cos Signal	> 4.0V	Wakeup Signal Resolver Initialization Delay Once Resolver has indicated a fault, a Retry timer is initiated. Retry Timer must be	ON 1.00 s > 0.05 s	Failure Conditions Met for 0.20 to 0.40 seconds out of a 2.00 second window	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 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.	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	RUN > 10.00 ms ≠ Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 900.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	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.	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	Run > 10.00 ms ≠ Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 900.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	Type A, 1 Trips

17 OBDG02 Motor Control Processor (MCP1A) Summary Tables

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.	Peak Phase Axis Current on the W phase	< 9.00 Amps	Drive State Delay Timer Inverter State Inverter Power State Inverter Voltage Rotor Position Squared Current Comanded	Run > 10.00 ms ≠Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 900.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	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 status of the IGBTs. The IGBT module will continually monitor the IGBTs for a short between the upper and lower phase. The module will then report out a status of being in a DeSat fault. If the DeSat fault status is present for sufficient time, the diagnostic will fail.	Phase A, B, or C High or Low Side IGBT	DSatFltPending (Status Fault Bit)	Wakeup Signal	ON	0.002 seconds out of a 1 seconds window (x of y)	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 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 certain 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.	ABS(Inverter Phase U Temp- Cold Soak Average Temp)	> 20.00 degrees C	Vehicle off soak timer met Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Time after controller intialization	= TRUE > -20.00 C P0AF0 and P0AEF > 5.13 seconds	0.525 seconds out of a 0.625 seconds window (x of y)	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.	Inverter Phase U Temperature Sensor	> 170.00 degrees C	Sensor Exists WakeUp Signal	= 1.00 On	2.5 seconds out of a 3.5 seconds window (x of y)	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.	Inverter Phase U Temperature Sensor	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(20.00)Nm	2.625 seconds out of a 3.65 seconds window (x of y)	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 C Circuit Range/ Performance	P0BD2	This diagnostic verifies that the motor inverter phase V 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 after a specified 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.	ABS(Inverter Phase V Temp- Cold Soak Average Temp)	> 20.00 degrees C	Vehicle off soak timer met Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Time after controller intialization	= TRUE > -20.00 C P0BD3 and P0BD4 > 5.13 seconds	0.525 seconds out of a 0.625 seconds window (x of y)	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 C Circuit Low	P0BD3	This diagnostic monitor for inverter phase V 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.	Inverter Phase V Temperature Sensor	> 170.00 degrees C	Sesor Exists WakeUp Signal	= 1.00 ON	2.5 seconds out of a 3.5 seconds window (x of y)	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 C Circuit High	P0BD4	This diagnostic monitor for inverter phase V 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.	Inverter Phase V Temperature Sensor	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(20.00)Nm	2.625 seconds out of a 3.65 seconds window (x of y)	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 E Circuit Range/ Performance	P0BDC	This diagnostic verifies that the high voltage electric motor inverter phase "W" 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 certain 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.	ABS(Inverter Phase W Temp- Cold Soak Average Temp)	> 20.00 degrees C	Vehicle off soak timer met Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Time after controller intialization	= TRUE > -20.00 C P0BDD and P0BDE > 5.13 seconds	0.525 seconds out of a 0.625 seconds window (x of y)	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 E Circuit Low	P0BDD	This diagnostic monitor for inverter phase W 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.	Inverter Phase W Temperature Sensor	> 170.00 degrees C	Sesor Exists WakeUp Signal	= 1.00 ON	2.5 seconds out of a 3.5 seconds window (x of y)	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 E Circuit High	P0BDE	This diagnostic monitor for inverter phase W 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.	Inverter Phase W Temperature Sensor	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(20.00)Nm	2.625 seconds out of a 3.65 seconds window (x of y)	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, if the offset value is larger than the fail threshold the diagnostic will fail.	U phase offset current learn value	> 30.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fail conditions met 0.10 sec after enable conditions met	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.	U phase current sensor output at highside	< -700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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.	U phase current sensor output highside	> 700.00 amps	Wakeup Signal Enable Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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	> 30.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fai conditions met 0.10 Sec after enable conditions met	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.	V phase current sensor output at highside	< -700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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.	V phase current Sensor output at highside	> 700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 Sensor Offset Out-of Range	P0BEE	This diagnostic monitors the offset that is learned by the phase “W” 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.	W phase current sensor offset learn value	> 30.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fail condidtions met 0.10 sec after enable conditoins met	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 Sensor Circuit Low	P0BEF	This diagnostic monitors for the "W" 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.	W phase current sensor output at highside	< -700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 Sensor Circuit High	P0BF0	This diagnostic monitors for the "W" 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.	W phase current sensor output at high side	> 700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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	This diagnostic monitors the U, V, and W phase currents for balance. The absolute value of the sum of the phase values is compared against a threshold. If the sum is above the failure threshold for sufficient time, the diagnostic will fail.	Sum of U-V-W phase currents	≥ 110.00 amps	Wakeup Signal Run Flag	On = 1.00	0.0032 seconds out of a 0.0038 seconds window (x of y)	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 implements the use of 2 different fail timers, one fast and one slow. The fast timer has a very short sample window so that the diagnostic will detect a sudden fault, the slower timer has a longer sample window to allow the diagnostic to detect an intermittent fault.	U, V, or W Phase Current Sensor	> 600.00 amps	Wakeup Signal	On	0.0104 seconds out of a 0.104 seconds window (x of y) OR 0.00416 seconds out of a 0.0208 seconds window (x of y)	Type A, 1 Trips
			D Axis current less than calculated threshold determined by stator temperature listed in supporting table unless the motor temperature reading is faulted, then D Axis current threshold is determined by a default value	D-Axis Current< -600.00 amps (faulted motor temp value) **P0C01 D-Axis Current Thresholds** (See supporting tables for expected threshold values for non-faulted motor temperature readings)	Wakeup Signal	On	0.0104 seconds out of a 0.104 seconds window (x of y) OR 0.00416 seconds out of a 0.0208 seconds window (x of y)	

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 the status of the IGBTs. The IGBT module will continuously monitor the supply circuit voltage. When the supply circuit drops below a threshold voltage the module then report out a status of being in a Bias fault. If the Bias fault status is present for sufficient time, the diagnostic will fail.	Phase A, B, or C Power Supply	Failed (Status Fault Bit)	Inverter State	Initialization Complete	0.002 seconds out of a 0.024 seconds window (x of y)	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.	Inverter Phase U Temperature	> 126.00 degrees C	PIM Phase U Temperature	TEMP NORMAL	1.2 seconds out of a 2 seconds window (x of y)	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 V Over Temperature	P0C12	This diagnostic monitors the inverter phase V 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.	Inverter Phase V Temperature	> 126.00 degrees C	PIM Phase V Temperature	TEMP Normal	1.2 seconds out of a 2 seconds window (x of y)	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 W Over Temperature	P0C13	This diagnostic monitors the inverter phase W 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.	Inverter Phase W Temperature	> 126.00 degrees C	PIM Phase W Temperature	TEMP NORMAL	1.2 seconds out of a 2 seconds window (x of y)	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 Position Sensor Not Learned	P0C17	This diagnostic monitors the initial offset that is learned by the resolver circuit. The diagnostic runs only when there is no previously stored value for the resolver offset. The diagnostic fails when during the learn process either the motor speed is higher than a threshold, the total high voltage bus is below a threshold voltage, the peak to peak current on the motor falls below a threshold, or the learn process takes longer than a threshold time.	Initial Offset Learn Could Not Complete Because: ABS(Motor Speed)	> 50.00 rpm	Key Off	TRUE	0.30 s Learn Time	Type A, 1 Trips
			Initial Offset Learn Could Not Complete Because: Filtered DC	< 200.00 V	Key Off	TRUE	0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: ALL phase Current	< 30.00 A	Key Off	TRUE	0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: Learn Timer	> 1.40 s	Key Off	TRUE	0.30 s Learn Time	

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. When the difference between commanded motor torque and actual motor torque is greater than the indicated threshold for longer than the timer threshold, the DTC is set.	Absolute value of (Commanded torque - Torque Command Slewed)	> 123.00 Nm	DTCs not Fault Active AND DTCs not Fault Active AND Motor Drive State ID AND ((DTCs not Fault Active) OR (Voltage Hazard Active AND Motor Temperature Fault Active))	(P1AF5 or P1B0C or P1B41) (P0A3F or P0A40 or P1B03 or P16EB) = Run P0BFD = True = False	0.1875 seconds out of a 0.2 seconds window	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 Position Exceeded Learning Limit	P0C4E	This diagnostic monitors the offset that is learned by the resolver circuit. The diagnostic runs on every key off cycle after the offset learn has completed. Once the offset value has been determined it is compared to a threshold. If the value of the offset is above the fail threshold, the diagnostic will fail. Another way the diagnostic can fail is once the offset learn has completed and the offset value determined, it is then compared against the previously stored offset value. If the absolute value of the difference between the previous offset value and the current offset value is above the failure threshold the diagnostic will fail.	Offset Learn Completes AND ABS(Offset Correction Angle)	> 30.00 degrees	Key Off Offset Learn Status	TRUE Complete	5.00 key off cycles of out of offset angle being out of range	Type A, 1 Trips
			Offset Learn Completes AND ABS(Offset Correction Angle - prevoiusly stored value)	> 10.00 degrees	Key Off Offset Learn Status	TRUE Complete	5.00 key off cycles of out of offset angle being out of range	

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.	Resolver S13 Circuit Reference Voltage	< 0.50 V	Wakeup Signal	ON	0.525 seconds out of a 0.8375 seconds window (x of y)	Type B, 2 Trips

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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.	Resolver S13 Circuit Reference Voltage	> 4.50 V	Wakeup Signal	ON	0.2125 seconds out of a 0.3125 seconds window (x of y)	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.	Resolver S24 Circuit Reference Voltage	< 0.50 V	Wakeup Signal	ON	0.525 seconds out of a 0.8375 seconds window (x of y)	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 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.	Resolver S24 Circuit Reference Voltage	> 4.50 V	Wakeup Signal	ON	0.2125 seconds out of a 0.3125 seconds window (x of y)	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 Transmission & Hybrid Control Processor (THCP) and MCP is working correctly. Potential failures could be in the microprocessor's 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 in the time indicated.	CRC error on receive Number of missing messages OR Alive Rolling Count (ARC) incremented from previous value (0-3)	=True ≠ 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	0.175 seconds out of a 0.2 seconds window	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	0.175 seconds out of a 0.2 seconds window	
			Number of Missing Received Messages	> 4 messages	(Diagnostic System Code Clear Requested AND Diagnostic System Reset	= False = True	0.175 seconds out of a 0.2 seconds window	

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

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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 2.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	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" Inverter Phase V Temperature Sensor Erratic	P190B	This diagnostic monitors the inverter phase V 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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 2.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	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" Inverter Phase W Temperature Sensor Erratic	P190C	This diagnostic monitors the inverter phase W 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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 2.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	Type B, 2 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Not Programmed	P1A4F	This Diagnostic checks that the MCP micro-controller has a valid calibration flashed into it. The controller manufacturer flashes a calibration with a configuration ID. At the vehicle plant the controller is reflashed with a valid configuration ID. The DTC sets when the diagnostic checks the configuration ID and it does not match the correct ID.	MCP Processor Configuration ID	≠ CeMCGR_i_MCP1	None	NA	0.125 seconds out of a 0.2 seconds window	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 Random Access Memory (RAM)	P1A50	This Diagnostic tests the RAM in the MCP micro-controller. The diagnostic checks that RAM has not changed unexpectedly. Pattern checks are done at intiialization 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 "Y" variable	≠ Primary "V" variable for greater than 125 ms	Current Time Execution - Time of Last DualStore Error	> 25 ms	Executes in Background loop	Type A, 1 Trips
			HWIO detects an illegal write to Write Protected RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop 0 counts to fail	
			2nd Processor State of Health RAM Fault Latched	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop every 1000ms	
			Checksum of PreservedNVM_Region for Main Processor State of Health and 2nd Processor State Of Health	≠ Expected checksum value	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization	
			HWIO detects fault in System RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	
			HWIO detects fault in Cache RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	
			HWIO detects fault in eTPU RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Main SOH RAM Fault Latched AND SPI Fault Latched AND System RAM Fault Count AND Cache RAM Fault Count AND eTPU RAM Fault Count	= 0 = False = 0 = 0 = 0	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) Time Since Last Duel Store Error	= False = True > 1,000 ms	Executes in Background loop every 1000ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Read Only Memory (ROM)	P1A51	This Diagnostic tests ROM (flash) memory in the MCP 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 DTC sets when the checksum comparison does not match for the indicated number of times.	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 = False = True	1 failure if it occurs during the first ROM test of the ignition cycle otherwise 5 failures	Type A, 1 Trips
			2nd Processor State of Health ROM fault latched	= TRUE	Controller Status ROM Checksum in Progress (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On ≠ True = False = True	Runs continuously in the background	
			Calculated Checksum of Torque Security Related Calibrations	≠ Expected Checksum	Controller Status (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) = Enable Calibration is True = Enable Calibration is True	= On = False = True = 0 (0 is Enabled) = 1 (1 is Enabled)	1 failure if it occurs during the first ROM test of the ignition cycle otherwise 5 failures	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			ECC Fault detected in Flash memory	= TRUE	Controller Status Power Up Reset AND HWIO BINVDM ECC State AND HWIO ROM Fault Enable Calibration is true	= On = False = False = True = 1 (1 is Enabled)	Greater than 5 failures at controller initialization Runs once at initialization	
			ROM fault Active AND 2nd SOH ROM Fault Latched AND Main SOH ROM Fault Latched	≠ True ≠ True ≠ True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs in the Background	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Long Term Memory Performance	P1ADC	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 DTC sets if the fault is set in the indicated time.	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	Runs once at controller initialization	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 System Voltage Low	P1ADE	This diagnostic detects low voltage in the vehicle's 12 volt system. The fault sets when the host controller detects supply voltage below the indicated threshold for the indicated time.	Ignition Voltage	≤ 10.00 Volts	Enable Calibration is True AND 12V Starter Engaged AND Ignition Run/Crank Voltage AND Engine Speed (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False > 6.0 Volts ≥ 0.00 RPM = False = True	5 seconds out of a 6 seconds window	Type C, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module System Voltage High	P1ADF	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	≥ 16.00 Volts	Enable Calibration is True AND Ignition Run/Crank Voltage (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1.00 (1 is Enabled) > 6.0 Volts = False = True	5 seconds out of a 6 seconds window	Type C, No MIL

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.	High Voltage Sensor Voltage OR High Voltage Hardware Flag	> 450.00 Volts = True	Controller Initialization	Complete	0.004 seconds out of a 0.1 seconds window (x of y)	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 System Isolation Fault	P1AF0	This diagnostic monitors the high voltage bus for possible shorts 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.	Isolation Ratio (Neg mid-pack voltage / Pos mid-pack voltage)	> 4.53 OR < 0.21	No Active DTCs: Controller Initialization	P1AE8, P1AE9, P1AEC Complete	2.5 seconds out of a 5 seconds window (x of y)	Type B, 2 Trips

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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.	Positive mid-pack voltage	< 20.00 Volts	Controller Initialization Run Crank Active Contactors	Complete True Closed	0.7375 seconds out of a 1.05 seconds window (x of y)	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 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.	Positive mid-pack voltage - High Voltage sensor voltage	> 60.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.525 seconds out of a 1.05 seconds window (x of y)	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 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 threshold amount of time, the diagnostic will fail.	Internal Tracking Error	>5 Degrees	Wakeup Signal Resolver Initialization Delay Once Resolver has indicated a fault, a Retry timer is initiated. Retry Timer must be	ON 1.00 > 0.05 s	Failure Conditions Met for 0.20 to 0.40 seconds out of a 2.00 second window	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 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	Negative mid-pack voltage	< 20.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.7375 seconds out of a 1.05 seconds window (x of y)	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 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.	High Voltage Negative to Ground Reading - Total High Voltage Reading from High Voltage Battery	> 60.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.525 seconds out of a 1.05 seconds window (x of y)	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 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.	ABS(Motor Speed)	> 12,700.00 rpm	Wakeup Signal	On	0.09 seconds out of a 0.1 seconds window (x of y)	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 Position Sensor Learn Incorrect	P1B0F	This diagnostic monitors the offset that is learned by the resolver circuit. The diagnostic runs on every key off cycle while the offset learn process is in progress. The offset learn process can fail when during the learn process either the motor speed is higher than a threshold, the total high voltage bus is below a threshold voltage, the peak to peak current on the motor falls below a threshold, or the learn process takes longer than a threshold time. If the learn process fails for any one of the afore mentioned reasons a counter is increased and compared against a threshold. If the counter exceeds the threshold the diagnostic will fail.	Offset Learn Could Not Complete Because: ABS(Motor Speed) Consecutive Key Cycles where the offset learn is unable to complete	 > 50.00 rpm > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	Type B, 2 Trips
			Initial Offset Learn Could Not Complete Because: Filtered DC Consecutive Key Cycles where the offset learn is unable to complete	 < 200.00 V > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: ALL phase Current Consecutive Key Cycles where the offset learn is unable to complete	 < 30.00 A > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: Learn Timer Consecutive Key Cycles where the offset learn is unable to complete	 > 1.40 s > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	

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 high voltage positive and negative leg. 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.	ABS(Total High Voltage Measured By the Battery Pack - High Voltage Measured from Positve to Ground - High Voltage Measured from Negative to Ground)	≥ 70.00 V	No Active DTCs:	P1AE8, P1AE9, P1B0B, P1B0C	0.175 seconds out of a 0.2 seconds window (x of y)	Type A, 1 Trips
					Controller Initialization	Complete		
					Contactors	Closed		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Torque Calculation Performance	P1E0A	Fail Case 1, 5: This Diagnostic tests the calculation of output torque. Potential failures can include memory, software, processor and ALU faults. The primary calculated output torque value is compared to the secondary calculated output torque and if that difference is greater than the indicated threshold for the indicated time the fault is set. Fail Case 2 This diagnostic tests the calculation of output motor torque. Potential failures can include memory, software, processor and ALU faults. The fault is set if the differnece in calculated output motor torque and the secondary output motor torque is greater than the indicated calibration. The DTC is set if the fault is present for longer than the indicated time. Fail Case 3, 4: This diagnostic tests	Absolute difference between Torque Achieved in primary and secondary path is greater than the threshold value	> 123.00 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	Type A, 1 Trips
			Absolute difference between Torque Commmanded in primary and secondary path is greater than the threshold value Abs(Primary - Secondary) Or Absolute difference between Mtr Minimum Short Term Torque Commmanded in primary and secondary path is greater than the threshold value Abs(Primary - Secondary) Or Absolute difference between Mtr Maximum Short Term Torque Commmanded in primary and secondary path is greater than the threshold value Abs(Primary - Secondary)	> 123.00 Nm > 123.00 Nm > 123.00 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Difference between Issd in primary and secondary path is greater than the threshold value	> 50.00 Amps	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR	= Run = TRUE = FALSE	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the electronic current delivery circuits. The fault is set if the difference in current delivered between the primary and secondary paths is greater than the shown threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 6: This diagnostic tests the calculation of the back emf torque in the primary and secondary paths. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated back emf torque in the primary path is different from the secondary calculation path by more than the threshold given. The DTC is set if the fault is present for longer than the indicated time. Fail Case 7, 8, 9: This diagnostic compares different calculations of Usd and Usq in a primary and a secondary path. Potential failures can include memory,			TorqCalcPerf Flt counter OR TrqMntr Fault	≠ 0 = TRUE		
			Absolute difference between Issq in primary and secondary path is greater than the threshold value	> 50.00 Amps	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference between IssCmnd Torque in primary and secondary path is greater than the threshold value	> 123.00 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference between Back emf Torque in primary and secondary path is greater than the threshold value	> 0.015 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference between Usd Limited in primary and secondary path is greater than the threshold value Or Absolute difference between Usq Limited in primary and secondary	> 0.40 V (for Usd) > 0.40 V (for Usd)	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		software, processor and ALU faults. The fault is set if the calculated differences are greater than the indicated thresholds. The DTC is set if either fault is present for longer than the indicated time. Fail Case 10: This diagnostic tests the primary and secondary input power paths for motor A. Potential failures can include the power input circuits, microprocessor memory, software and calibration, processor and ALU faults. The fault is set if the difference between primary and secondary input power are greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 11: This diagnostic tests the primary and secondary input voltage paths for motor A. Potential failures can include the power input circuits, microprocessor	path is greater than the threshold value					
			UsdLmt Squared plus UsqLmt Squared OR DutyQ Squared plus DutyD Squared AND Duty Squared minus UsLmt Squared OR Perf Squared Duty Squared minus UsLmt Squared OR Perf Squared	> 0.70 > 0.70 > 0.30 > 1.00 > 0.10 > 0.15	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference of the Mod Index Square Calcluation for Usd and Usq for Volt Hz mode in primary and seconday paths	> 5.00 V	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Difference between Power Input in primary and secondary path is greater than or equal to the threshold value	>= 40,000.00 Watts	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Difference between Vdc Adapt in primary and secondary path is greater than or equal to the threshold value	>= 0.07 Volts	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter	= Run = TRUE = FALSE ≠ 0	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		memory, software and calibration, processor and ALU faults. The fault is set if the difference between primary and secondary voltage are greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time.			OR TrqMntr Fault	= TRUE		
			Difference between Reactive Power (Qest) in the primary and secondary path is greater than or equal to the threshold value	>= 43,755.40 Watts	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
		Fail Case 12: This diagnostic tests the primary and secondary reactive power paths for motor A. Potential failures can include the reactive power input circuits, microprocessor memory, software and calibration, processor and ALU faults. The fault is set if the difference between primary and secondary reactive power is greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 13: This diagnostic tests the primary and secondary resolver motor speed for motor A. The diagnostic tests	Calculated resolver Mtr Speed difference in the primary and secondary path is greater than the threshold value OR Calculated resolver Mtr Speed difference in the primary and secondary path is greater than the threshold value To Pass: Calculated resolver Mtr Speed AND Calculated Mtr Speed in radians/sec	> 20,000.00 rpm > 510.00 radians/sec < 19,000.00 rpm <= 146.00 rad	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the resolver circuits. The fault is set if the difference between primary and secondary motor speed is greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor A Control Module Long Term Memory Reset	P1EB6	This Diagnostic tests the NonVolatile Memory (NVM) in the MCP 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.	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 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 out of 5 controller initilizations for Failure	
			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	
			Static NVM Error Dynamic NVM Error BINVDM ECC Error	= False = False = False	Enable Calibration is True	= 1 (1 is Enabled)	Runs once at controller initialization	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Control Module A Lost Communication With Hybrid Powertrain Control Module B on Bus B	U182E	This diagnostic detects that the Hybrid Powertrain Control Module B has stopped sending messages on Bus B. If Hybrid Powertrain Control Module B message traffic is not received on Bus B by the MCPA controller in the indicated time the DTC is set.	Message is not received from controller for Message $1D8 Message $3C5 Message $3D7	 ≥ 0.5 seconds ≥ 0.5 seconds ≥ 0.5 seconds	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: KeCAND_b_OffKeyCycleDiagEnbl and Ignition Accessory Line and Battery Voltage and 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	 Not Active on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 11.00 > 0.4000 seconds	See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					U182E	Not Active on Current Key Cycle		
					Hybrid Powertrain Control Module B (VICM)	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Control Module A Lost Communication With Hybrid Powertrain Control Module	U1845	This diagnostic detects that the Hybrid Powertrain Control Module has stopped sending messages on Bus A. If Hybrid Powertrain Control Module message traffic is not received on Bus A by the MCPA controller in the indicated time the DTC is set.	Message is not received from controller for Message $1A45	≥ 10.00 seconds	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: KeCAND_b_OffKeyCycleDiagEnbl Ignition Accessory Line and Battery Voltage 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	Not Active on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 11.00 > 0.4000 seconds	See Threshold Value 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.
					U0293	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.
Drive Motor A Control Module Lost Communication With Engine Control Module (ECM)/ Powertrain Control Module (PCM)	U1876	This diagnostic detects that the Engine Control Module (ECM/PCM) has stopped sending messages. If ECM/ PCM message traffic is not received by the MCPA controller in the indicated time the DTC is set.	Message is not received from controller for Message $0C9 Message $1A3 Message $4C1 Message $4C7 Message $4F1	 ≥ 10.00 seconds ≥ 10.00 seconds ≥ 10.00 seconds ≥ 10.00 seconds ≥ 10.00 seconds	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: KeCAND_b_OffKeyCycle DiagEnbl Ignition Accessory Line and Battery Voltage 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 on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 11.00	See Threshold Value 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 U0293 Hybrid Powertrain Control Module	> 0.4000 seconds Not Active on Current Key Cycle is present on the bus		

Initial Supporting table - P0C01 D-Axis Current Thresholds

Description: X-Axis is stator temperature, Y-Axis is current threshold for the D-Axis current

y/x	1	2	3	4	5	6	7	8	9	10
1	-539	-482	-404	-337	-310	-310	-310	-310	-310	-310

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Performance	P0A1C	This Diagnostic tests all the internal processor subsystems for faults which suggest that the integrity of the processor can not be trusted. Fail Case 1: In case of many faults the MCP microprocessor along with the other 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 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 2, 3, 4, 5, 6: The microprocessors in the TPIM ECU monitor	Inhibit Path Test Failed Indicates that the Processor is not demonstrating the ability to inhibit the system (take remedial action) during the Inhibit Path Test "2ndFailsToTakeRmdlActn "	>= 3 Failures	HV Batt contactor Staus Available Invertor State HV Batt Voltage HV Contactors 12V Batt Voltage Vehicle Speed Motor Faults Motor Speed SRAR Shutdowns SPI Fault RunCrank Active Ram or ROM fault Seed received in wrong order fault Seed/Key Timeout Powermode Off time	= TRUE = Off >= 80.00 V = Closed > 9.50 V < 0.00 kph = FALSE (None active) <= 10.00 rpm = FALSE = FALSE (No active P0606) = FALSE = FALSE (No active P0601, P0604) = FALSE (No active P0606) = FALSE < 5.00 s	Executes in a 12.5ms loop Increment/ Decrement counter = 3	Type A, 1 Trips
			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 Mains Processors to monitor IPT status SPI Fault Run/Crank Voltage	> 0 = Not Running = FALSE (No active P0606) >= 9.50 V	Executes in a 12.5ms loop Detects in 150ms or two consecutive faulty keys	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		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. 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 7, 8, 9: These diagnostics are built into the hardware of the MCP microprocessor by the chip manufacturer. These diagnostics check the ALU and Configuration registers	New Seed Update Time Indicates that the Processor did not receive a key value from the secondary processor during the expected time frame "MainDtctdSdKeyTimeout "	> 1.00 sec	Number Of Mains 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 >= 9.50 V > 11 V	Executes in a 12.5ms loop Detects in 1 second	
			Seed sequence Indicates that the Processor received key values in the incorrect order from the secondary processor "MainDtctdSdRxWrongOr dr"	≠ expected order	Number Of Mains Processors to monitor AND SPI Faults AND Run/Crank Voltage OR 12V Battery Voltage	> 0 = FALSE (No active P0606) >= 9.50 V > 11 V	0.15 seconds out of a 0.2 seconds window Executes in a 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"	> 0.20 ms	Seed Update Key Store Fault Enable is true	= 0 (1 is Enabled)	Executes in a 50ms loop after controller initialization	
			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_ProgSeqWatc hEnbl[x])	= TRUE	0.15 seconds out of a 0.2 seconds window	
			HWIO detects Fault in	= 2 faults in a key cycle	Enabled Calibration is	= 1 (1 is Enabled)	Runs	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		to ensure there have been no changes. The DTC sets if these reigsters 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 10: This diagnostic checks the analog to digital converter (ADC) in the MCP 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 11, 12: These diagnostics use microprocessor internal circuitry to detect there are faults in the RAM or Flash memory. The checks occur at power up and will set the DTC if there are the indicated number of	ALU Test Indicates that the Processor detected an ALU fault in the processor "MainALU_Flt"		True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) AND Run Crank Ingnition Low Voltage AND Run Crank Low Voltage Crank	 = False = True ≠ True ≠ True	continuously in 12.5ms loop	
			HWIO detects Fault in Configuration Registry Test Indicates that the Processor detected a Configuration Register fault in the processor "MainCfgRegFlt"	= 2 faults in a key cycle	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) AND Run Crank Ingnition Low Voltage AND Run Crank Low Voltage Crank	= 1 (1 is Enabled) = False = True ≠ True ≠ True	Runs continuously in 12.5ms loop	
			HWIO detects Fault in the Stack Limit Test Indicates that the CPU Stack memory exceeded the limit "MainStackFlt"	= 2 faults since power up	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False = True	Runs Continuously in 100ms loop	
			voltage diff between real circuit and test circuit Indicates that the Processor detected a problem with the Analog to Digital convertor test	> 16 V	Enable Calibration is True AND Run/Crank Voltage (Diagnostic System Code Clear Requested AND	= 1 (1 is Enabled) >= 7 V = False	0.15 seconds out of a 0.2 seconds window OR A2D Converter Test Error >= 0.20 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		failures in each diagnostic. Fail Case 13: 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.	circuit "MainADC_Flt"		Diagnostic System Reset Complete)	= True		
			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 reset 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle)	
			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 Rest	= 1 (1 is Enabled) = TRUE	Executes once at every power up reset 3.00 failed cycles out of 10.00 cycles (turns on MIL) 5.00 failed cycles out of 10.00 cycles (shutdown vehicle)	
			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	= TRUE = TRUE	Enable Calibration is True (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1 (1 is Enabled) = False = True	50ms Execution Rate after controller initialization	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			transfer from Flash memory to RAM memory "DMA_XferTest"					
			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	Executes at the end of every trip	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Position Sensor Circuit	P0A45	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 threshold amount of time, the diagnostic will fail.	Amplitude of Sin or Cos Signal	<2.3V	Wakeup Signal Resolver Initialization Delay Once Resolver has indicated a fault, a Retry timer is initiated. Retry Timer must be	ON 1.00 s > 0.05 s	Failure Conditions Met for 0.20 to 0.40 seconds out of a 2.00 second window	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 B Position Sensor Circuit Range/ Performance	P0A46	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 threshold amount of time, the diagnostic will fail.	Sin or Cos Signal	>4.0V	Wakeup Signal Resolver Initialization Delay Once Resolver has indicated a fault, a Retry timer is initiated. Retry Timer must be	ON 1.00 s > 0.05 s	Failure Conditions Met for 0.20 to 0.40 seconds out of a 2.00 second window	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 Inverter Temperature Sensor B Circuit Range/ Performance	P0AF3	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 certain 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.	ABS(Inverter A Temp- Cold Soak Average Temp)	> 20.00 degrees C	Vehicle off soak timer met Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Time after controller intialization	= TRUE > -20.00 C P0AF4 and P0AF5 > 5.13 seconds	0.525 seconds out of a 0.625 seconds window (x of y)	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 B Circuit Low	P0AF4	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.	Inverter Phase U Temperature Sensor	> 170.00 degrees C	Sesor Exists WakeUp Signal	= 1.00 On	2.5 seconds out of a 3.5 seconds window (x of y)	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 B Circuit High	P0AF5	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.	PIM Temperature Sensor A Inverter Phase U Temperature Sensor	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(20.00)Nm	2.625 seconds out of a 3.65 seconds window (x of y)	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 D Circuit Range/ Performance	P0BD7	This diagnostic verifies that the motor inverter phase V 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 after a specified 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.	ABS(Inverter Phase V Temp- Cold Soak Average Temp)	> 20.00 degrees C	Vehicle off soak timer met Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Time after controller intialization	= TRUE > -20.00 C P0BD8 and P0BD9 > 5.13 seconds	0.525 seconds out of a 0.625 seconds window (x of y)	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 D Circuit Low	P0BD8	This diagnostic monitor for inverter phase V 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.	Inverter Phase V Temperature Sensor	> 170.00 degrees C	Sesor Exists WakeUp Signal	= 1.00 ON	2.5 seconds out of a 3.5 seconds window (x of y)	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 D Circuit High	P0BD9	This diagnostic monitor for inverter phase V 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.	Inverter Phase V Temperature Sensor	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(20.00)Nm	2.625 seconds out of a 3.65 seconds window (x of y)	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 F Circuit Range/ Performance	P0BE1	This diagnostic verifies that the high voltage electric motor inverter phase "W" 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 certain 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.	ABS(Inverter Phase W Temp- Cold Soak Average Temp)	> 20.00 degrees C	Vehicle off soak timer met Cold Start Average Temperature No Active Power Inverter Temp Out Of Range Faults: Time after controller intialization	= TRUE > -20.00 C P0BE2 and P0BE3 > 5.13 seconds	0.525 seconds out of a 0.625 seconds window (x of y)	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 F Circuit Low	P0BE2	This diagnostic monitor for inverter phase W 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.	Inverter Phase W Temperature Sensor	> 170.00 degrees C	Sesor Exists WakeUp Signal	= 1.00 ON	2.5 seconds out of a 3.5 seconds window (x of y)	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 F Circuit High	P0BE3	This diagnostic monitor for inverter phase W 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.	Inverter Phase W Temperature Sensor	< -50.00 degrees C	Sensor Exists Wakeup Signal Inverter Warmup Time at or above inverter warmup torque	= 1.00 ON >= 90.00 s >=ABS(20.00)Nm	2.625 seconds out of a 3.65 seconds window (x of y)	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 "B" Inverter Phase U Over Temperature	P0C14	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.	Inverter Phase U Temperature	> 131.00 degrees C	PIM Phase U Temperature	TEMP NORMAL	1.2 seconds out of a 2 seconds window (x of y)	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 "B" Inverter Phase V Over Temperature	P0C15	This diagnostic monitors the inverter phase V 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.	PIM Phase V Temperature	> 131.00 degrees C	PIM Phase V Temperature	TEMP Normal	1.2 seconds out of a 2 seconds window (x of y)	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 "B" Inverter Phase W Over Temperature	P0C16	This diagnostic monitors the inverter phase W 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.	PIM Phase W Temperature	> 131.00 degrees C	PIM Phase W Temperature	TEMP NORMAL	1.2 seconds out of a 2 seconds window (x of y)	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 B Position Sensor Not Learned	P0C18	This diagnostic monitors the initial offset that is learned by the resolver circuit. The diagnostic runs only when there is no previously stored value for the resolver offset. The diagnostic fails when during the learn process either the motor speed is higher than a threshold, the total high voltage bus is below a threshold voltage, the peak to peak current on the motor falls below a threshold, or the learn process takes longer than a threshold time.	Initial Offset Learn Could Not Complete Because: ABS(Motor Speed)	> 50.00 rpm	Key Off	TRUE	0.30 s Learn Time	Type A, 1 Trips
			Initial Offset Learn Could Not Complete Because: Filtered DC	< 200.00 V	Key Off	TRUE	0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: ALL phase Current	< 30.00 A	Key Off	TRUE	0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: Learn Timer	> 1.40 s	Key Off	TRUE	0.30 s Learn Time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Torque Delivered Performance	P0C1A	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. When the difference between commanded motor torque and actual motor torque is greater than the indicated threshold for longer than the timer threshold, the DTC is set.	Absolute value of (Commanded torque - Torque Command Slewed)	> 132.00 Nm	DTCs not Fault Active AND DTCs not Fault Active AND Motor Drive State ID AND ((DTCs not Fault Active) OR (Voltage Hazard Active AND Motor Temperature Fault Active))	(P1AF5 or P1B0C or P1B41) (P0A3F or P0A40 or P1B03 or P16EB) = Run P0BFD = True = False	0.1875 seconds out of a 0.2 seconds window	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 B Position Exceeded Learning Limit	P0C4F	This diagnostic monitors the offset that is learned by the resolver circuit. The diagnostic runs on every key off cycle after the offset learn has completed. Once the offset value has been determined it is compared to a threshold. If the value of the offset is above the fail threshold, the diagnostic will fail. Another way the diagnostic can fail is once the offset learn has completed and the offset value determined, it is then compared against the previously stored offset value. If the absolute value of the difference between the previous offset value and the current offset value is above the failure threshold the diagnostic will fail.	Offset Learn Completes AND ABS(Offset Correction Angle)	> 30.00 degrees	Key Off Offset Learn Status	TRUE Complete	5.00 key off cycles of out of offset angle being out of range	Type A, 1 Trips
			Offset Learn Completes AND ABS(Offset Correction Angle - prevoiusly stored value)	> 10.00 degrees	Key Off Offset Learn Status	TRUE Complete	5.00 key off cycles of out of offset angle being out of range	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Position Sensor Circuit A Low	P0C57	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.	Resolver S13 Circuit Reference Voltage	< 0.50 V	Wakeup Signal	ON	0.525 seconds out of a 0.8375 seconds window (x of y)	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 B Position Sensor Circuit A High	P0C58	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.	Resolver S13 Circuit Reference Voltage	> 4.50 V	Wakeup Signal	ON	0.2125 seconds out of a 0.3125 seconds window (x of y)	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 B Position Sensor Circuit B Low	P0C61	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.	Resolver S24 Circuit Reference Voltage	< 0.50 V	Wakeup Signal	ON	0.525 seconds out of a 0.8375 seconds window (x of y)	Type B, 2 Trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Position Sensor Circuit B High	P0C62	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.	Reslover S24 Circuit Reference Voltage	> 4.50 V	Wakeup Signal	ON	0.2125 seconds out of a 0.3125 seconds window (x of y)	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 2	P16E9	This diagnostic checks that the SPI communication between the Transmission & Hybrid Control Processor (THCP) and MCP is working correctly. Potential failures could be in the microprocessor's 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 in the time indicated.	CRC error on receive Number of missing messages OR Alive Rolling Count (ARC) incremented from previous value (0-3)	=True ≠ 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	0.175 seconds out of a 0.2 seconds window	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	0.175 seconds out of a 0.2 seconds window	
			Number of Missing Received Messages	> 4 messages	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	0.175 seconds out of a 0.2 seconds window	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor "B" Inverter Phase U Temperature Sensor Erratic	P190D	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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 0.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	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 "B" Inverter Phase V Temperature Sensor Erratic	P190E	This diagnostic monitors the inverter phase V 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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 0.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	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 "B" Inverter Phase W Temperature Sensor Erratic	P190F	This diagnostic monitors the inverter phase W 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.	A rolling average of temperature readings calculated over 0.38 s this calculation is known as a string length. Temperature readings are taken every .025s.	> an estimated string length calculated based on stator current.	Start-Up Delay	> 0.13 s	1.75 seconds out of a 2.375 seconds window (x of y)	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 B Control Module Not Programmed	P1A52	This Diagnostic checks that the MCP micro-controller has a valid calibration flashed into it. The controller manufacturer flashes a calibration with a configuration ID. At the vehicle plant the controller is reflashed with a valid configuration ID. The DTC sets when the diagnostic checks the configuration ID and it does not match the correct ID.	MCP Processor Configuration ID	≠ CeMCGR_i_MCP2	None	NA	0.125 seconds out of a 0.2 seconds window	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 B Control Module Random Access Memory (RAM)	P1A53	This Diagnostic tests the RAM in the MCP micro-controller. The diagnostic checks that RAM has not changed unexpectedly. Pattern checks are done at intiialization 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 "Y" variable	≠ Primary "V" variable for greater than 125 ms	Current Time Execution - Time of Last DualStore Error	> 25 ms	Executes in Background loop	Type A, 1 Trips
			HWIO detects an illegal write to Write Protected RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop 0 counts to fail	
			2nd Processor State of Health RAM Fault Latched	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Executes in Background loop every 1000ms	
			Checksum of PreservedNVM_Region for Main Processor State of Health and 2nd Processor State Of Health	≠ Expected checksum value	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization	
			HWIO detects fault in System RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	
			HWIO detects fault in Cache RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	
			HWIO detects fault in eTPU RAM	= TRUE	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs once at Initialization 1 count to fail	
			Main SOH RAM Fault Latched AND SPI Fault Latched	= 0 = False	(Diagnostic System Code Clear Requested AND Diagnostic System Reset	= False = True	Executes in Background loop every 1000ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND System RAM Fault Count AND Cache RAM Fault Count AND eTPU RAM Fault Count	 = 0 = 0 = 0	Complete) Time Since Last Duel Store Error	 > 1,000 ms		

17 OBDG02 Motor Control Processor (MCP2B) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Read Only Memory (ROM)	P1A54	This Diagnostic tests ROM (flash) memory in the MCP 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 DTC sets when the checksum comparison does not match for the indicated number of times.	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 = False = True	1 failure if it occurs during the first ROM test of the ignition cycle otherwise 5 failures	Type A, 1 Trips
			2nd Processor State of Health ROM fault latched	= TRUE	Controller Status ROM Checksum in Progress (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= On ≠ True = False = True	Runs continuously in the background	
			Calculated Checksum of Torque Security Related Calibrations	≠ Expected Checksum	Controller Status (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete) = Enable Calibration is True = Enable Calibration is True	= On = False = True = 0 (0 is Enabled) = 1 (1 is Enabled)	1 failure if it occurs during the first ROM test of the ignition cycle otherwise 5 failures	

17 OBDG02 Motor Control Processor (MCP2B) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			ECC Fault detected in Flash memory	= TRUE	Controller Status Power Up Reset AND HWIO BINVDM ECC State AND HWIO ROM Fault Enable Calibration is true	= On = False = False = True = 1 (1 is Enabled)	Greater than 5 failures at controller initialization Runs once at initialization	
			ROM fault Active AND 2nd SOH ROM Fault Latched AND Main SOH ROM Fault Latched	≠ True ≠ True ≠ True	(Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= False = True	Runs in the Background	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Long Term Memory Performance	P1ADD	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 DTC sets if the fault is set in the indicated time.	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	Runs once at controller initialization	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 B Control Module System Voltage Low	P1AE0	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.	Ignition Voltage	≤ 10.00 Volts	Enable Calibration is True AND 12V Starter Engaged AND Ignition Run/Crank Voltage AND Engine Speed (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1.00 (1 is Enabled) = False > 6.0 Volts ≥ 0.00 RPM = False = True	5 seconds out of a 6 seconds window	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module System Voltage High	P1AE1	This diagnostic detects high voltage in the vehicle's 12 volt system. The fault sets when the THCP detects supply voltage above the indicated threshold for the indicated time.	Ignition Voltage	≥ 16.00 Volts	Enable Calibration is True AND Ignition Run/Crank Voltage (Diagnostic System Code Clear Requested AND Diagnostic System Reset Complete)	= 1.00 (1 is Enabled) > 6.0 Volts = False = True	5 seconds out of a 6 seconds window	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Hybrid Battery System Voltage High	P1AEF	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.	High Voltage Sensor Voltage OR High Voltage Hardware Flag	> 450.00 Volts = True	Controller Initialization	Complete	0.004 seconds out of a 0.1 seconds window (x of y)	Type A, 1 Trips

17 OBDG02 Motor Control Processor (MCP2B) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Hybrid Battery Voltage System Isolation Fault	P1AF2	This diagnostic monitors the high voltage bus for possible shorts 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.	Isolation Ratio (Neg mid-pack voltage / Pos mid-pack voltage)	> 4.53 OR < 0.21	No Active DTCs: Controller Initialization	P1AE8, P1AE9, P1AEC Complete	2.5 seconds out of a 5 seconds window (x of y)	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 B Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit Low	P1AF6	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.	Positive mid-pack voltage	< 20.00 Volts	Controller Initialization Run Crank Active Contactors	Complete True Closed	0.7375 seconds out of a 1.05 seconds window (x of y)	Type A, 1 Trips

17 OBDG02 Motor Control Processor (MCP2B) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit High	P1AF7	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.	Pos mid-pack voltage - High Voltage sensor voltage	> 60.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.525 seconds out of a 1.05 seconds window (x of y)	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 B Position Sensor Circuit Loss of Tracking	P1B04	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 threshold amount of time, the diagnostic will fail.	Internal Tracking Error	>5 Degrees	Wakeup Signal Resolver Initialization Delay Once Resolver has indicated a fault, a Retry timer is initiated. Retry Timer must be	ON 1.00 > 0.05 s	Failure Conditions Met for 0.20 to 0.40 seconds out of a 2.00 second window	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 B Position Sensor Circuit Overspeed	P1B0E	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.	ABS(Motor Speed)	> 12,700.00 rpm	Wakeup Signal	On	0.09 seconds out of a 0.1 seconds window (x of y)	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 B Position Sensor Learn Incorrect	P1B10	This diagnostic monitors the offset that is learned by the resolver circuit. The diagnostic runs on every key off cycle while the offset learn process is in progress. The offset learn process can fail when during the learn process either the motor speed is higher than a threshold, the total high voltage bus is below a threshold voltage, the peak to peak current on the motor falls below a threshold, or the learn process takes longer than a threshold time. If the learn process fails for any one of the afore mentioned reasons a counter is increased and compared against a threshold. If the counter exceeds the threshold the diagnostic will fail.	Offset Learn Could Not Complete Because: ABS(Motor Speed) Consecutive Key Cycles where the offset learn is unable to complete	 > 50.00 rpm > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	Type B, 2 Trips
			Initial Offset Learn Could Not Complete Because: Filtered DC Consecutive Key Cycles where the offset learn is unable to complete	 < 200.00 V > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: ALL phase Current Consecutive Key Cycles where the offset learn is unable to complete	 < 30.00 A > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	
			Initial Offset Learn Could Not Complete Because: Learn Timer Consecutive Key Cycles where the offset learn is unable to complete	 > 1.40 s > 15.00 cycles	Key Off	TRUE	15.00 consecutive key cyles with a 0.30 s Learn Time	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Hybrid Battery Voltage Isolation Sensing Performance	P1B42	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 high voltage positive and negative leg. 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.	ABS(Total High Voltage Measured By the Battery Pack - High Voltage Measured from Positve to Ground - High Voltage Measured from Negative to Ground)	>= 70.00 V	No Active DTCs: Controller Initialization Contactors	P1AE8, P1AE9, P1B0B, P1B0C Complete Closed	0.175 seconds out of a 0.2 seconds window (x of y)	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 B Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit Low	P1B43	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	Negative mid-pack voltage	< 20.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.7375 seconds out of a 1.05 seconds window (x of y)	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 B Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit High	P1B44	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.	High Voltage Negative to Ground Reading - Total High Voltage Reading from High Voltage Battery	> 60.00 Volts	Controller Initialization Run/Crank Active Contactors	Complete True Closed	0.525 seconds out of a 1.05 seconds window (x of y)	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 B Control Module Torque Calculation Performance	P1E0B	Fail Case 1, 5: This Diagnostic tests the calculation of output torque. Potential failures can include memory, software, processor and ALU faults. The primary calculated output torque value is compared to the secondary calculated output torque and if that difference is greater than the indicated threshold for the indicated time the fault is set. Fail Case 2 This diagnostic tests the calculation of output motor torque. Potential failures can include memory, software, processor and ALU faults. The fault is set if the differnece in calculated output motor torque and the secondary output motor torque is greater than the indicated calibration. The DTC is set if the fault is present for longer than the indicated time. Fail Case 3, 4: This diagnostic tests the electronic current delivery circuits. The	Absolute difference between Torque Achieved in primary and secondary path is greater than the threshold value	> 132.00 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	Type A, 1 Trips
			Absolute difference between Torque Commmanded in primary and secondary path is greater than the threshold value Abs(Primary - Secondary) OR Absolute difference between Mtr Minimum Short Term Torque Commmanded in primary and secondary path is greater than the threshold value Abs(Primary - Secondary) OR Absolute difference between Mtr Maximum Short Term Torque Commmanded in primary and secondary path is greater than the threshold value Abs(Primary - Secondary)	> 132.00 Nm > 132.00 Nm > 132.00 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Difference between Issd in primary and secondary path is greater than the threshold value	> 50.00 Amps	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR	= Run = TRUE = FALSE	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		fault is set if the difference in current delivered between the primary and secondary paths is greater than the shown threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 6: This diagnostic tests the calculation of the back emf torque in the primary and secondary paths. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated back emf torque in the primary path is different from the secondary calculation path by more than the threshold given. The DTC is set if the fault is present for longer than the indicated time. Fail Case 7, 8, 9: This diagnostic compares different calculations of Usd and Usq in a primary and a secondary path. Potential failures can include memory, software, processor and ALU faults. The fault is set if the calculated differences			TorqCalcPerf Flt counter OR TrqMntr Fault	≠ 0 = TRUE		
			Absolute difference between Issq in primary and secondary path is greater than the threshold value	> 50.00 Amps	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference between IssCmnd Torque in primary and secondary path is greater than the threshold value	> 132.00 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference between Back emf Torque in primary and secondary path is greater than the threshold value	> 0.015 Nm	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference between Usd Limited in primary and secondary path is greater than the threshold value OR Absolute difference between Usq Limited in primary and secondary	> 0.40 V (for Usd) > 0.40 V (for Usd)	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		are greater than the indicated thresholds. The DTC is set if either fault is present for longer than the indicated time. Fail Case 10: This diagnostic tests the primary and secondary input power paths for motor A. Potential failures can include the power input circuits, microprocessor memory, software and calibration, processor and ALU faults. The fault is set if the difference between primary and secondary input power are greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 11: This diagnostic tests the primary and secondary input voltage paths for motor A. Potential failures can include the power input circuits, microprocessor memory, software and calibration, processor and ALU faults. The fault is set if the difference between	path is greater than the threshold value					
			UsdLmt Squared plus UsqLmt Squared OR DutyQ Squared plus DutyD Squared AND Duty Squared minus UsLmt Squared OR Perf Squared Duty Squared minus UsLmt Squared OR Perf Squared	> 0.70 > 0.70 > 0.30 > 1.00 > 0.10 > 0.15	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Absolute difference of the Mod Index Square Calcluation for Usd and Usq for Volt Hz mode in primary and seconday paths	> 5.00 V	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Difference between Power Input in primary and secondary path is greater than or equal to the threshold value	>= 40,000.00 Watts	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Difference between Vdc Adapt in primary and secondary path is greater than or equal to the threshold value	>= 0.07 Volts	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter	= Run = TRUE = FALSE ≠ 0	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		primary and secondary voltage are greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 12: This diagnostic tests the primary and secondary reactive power paths for motor A. Potential failures can include the reactive power input circuits, microprocessor memory, software and calibration, processor and ALU faults. The fault is set if the difference between primary and secondary reactive power is greater than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time. Fail Case 13: This diagnostic tests the primary and secondary resolver motor speed for motor A. The diagnostic tests the resolver circuits. The fault is set if the difference between primary and secondary motor speed is greater			OR TrqMntr Fault	 = TRUE		
			Difference between Reactive Power (Qest) in the primary and secondary path is greater than or equal to the threshold value	>= 43,755.40 Watts	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	
			Calculated resolver Mtr Speed difference in the primary and secondary path is greater than the threshold value OR Calculated resolver Mtr Speed difference in the primary and secondary path is greater than the threshold value To Pass: Calculated resolver Mtr Speed AND Calculated Mtr Speed in radians/sec	> 20,000.00 rpm > 510.00 radians/sec < 19,000.00 rpm <= 146.00 rad	DriveStateID TorqCalcPerf Flt Active OR TorqCalcPerf TPTKO OR TorqCalcPerf Flt counter OR TrqMntr Fault	= Run = TRUE = FALSE ≠ 0 = TRUE	0.1875 seconds out of a 0.2 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		than the indicated threshold. The DTC is set if the fault is present for longer than the indicated time.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Control Module Long Term Memory Reset	P1EB7	This Diagnostic tests the NonVolatile Memory (NVM) in the MCP 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.	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 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 out of 5 controller initilizations for Failure	
			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	
			Static NVM Error Dynamic NVM Error BINVDM ECC Error	= False = False = False	Enable Calibration is True	= 1 (1 is Enabled)	Runs once at controller initialization	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Control Module B Lost Communication With Hybrid Powertrain Control Module B on Bus B	U182F	This diagnostic detects that the Hybrid Powertrain Control Module B has stopped sending messages on Bus B. If Hybrid Powertrain Control Module B message traffic is not received on Bus B by the MCPB controller in the indicated time the DTC is set.	Message is not received from controller for		General Enable Criteria:		See Threshold Value Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0074	Not Active on Current Key Cycle		
			Message $1D8	≥ 0.5 seconds				
					Normal CAN transmission on Bus B	Enabled		
			Message $3C5	≥ 0.5 seconds				
			Message $3D7	≥ 0.5 seconds	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:			
					KeCAND_b_OffKeyCycleDiagEnbl	= 1 (1 indicates enabled)		
					Ignition Accessory Line and	= Active		
					Battery Voltage	> 11.00		
					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		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					U182F	Not Active on Current Key Cycle		
					Hybrid Powertrain Control Module B (VICM)	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor Control Module B Lost Communication With Hybrid Powertrain Control Module	U1846	This diagnostic detects that the Hybrid Powertrain Control Module has stopped sending messages on Bus A. If Hybrid Powertrain Control Module message traffic is not received on Bus A by the MCPb controller in the indicated time the DTC is set.	Message is not received from controller for Message $1A5	 ≥ 10.00 seconds	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: KeCAND_b_OffKeyCycleDiagEnbl Ignition Accessory Line and Battery Voltage 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 on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 11.00	See Threshold Value 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	> 0.4000 seconds		
					U1846	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.
Drive Motor B Control Module Lost Communication With Engine Control Module (ECM)/ Powertrain Control Module (PCM)	U1879	This diagnostic detects that the Engine Control Module (ECM/PCM) has stopped sending messages. If ECM/ PCM message traffic is not received by the MCPB controller in the indicated time the DTC is set.	Message is not received from controller for Message $0C9 Message $1A3 Message $4C1 Message $4C7 Message $4F1	≥ 10.00 seconds ≥ 10.00 seconds ≥ 10.00 seconds ≥ 10.00 seconds ≥ 10.00 seconds	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: KeCAND_b_OffKeyCycleDiagEnbl Ignition Accessory Line and Battery Voltage 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	 Not Active on Current Key Cycle Enabled Not Active Not Active >= 9.50 = run = 1 (1 indicates enabled) = Active > 11.00 > 0.4000 seconds	See Threshold Value 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.
					U1879 Hybrid Powertrain Control Module	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.
Sensor Power Supply B Circuit Low	P06B4	This diagnostic monitors the IGBT power supply circuit voltage. The sensed voltage is compared against a threshold. If the sensed voltage is below the failure threshold for sufficient time, the diagnostic will fail.	Scaled 15V IGBT Supply Voltage	< 12.00 V	Wakeup Signal	ON	0.34 seconds out of a 0.42 seconds window (x of y) OR Continuous Fail Time > 0.30 seconds	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 B Circuit High	P06B5	This diagnostic monitors the IGBT power supply circuit voltage. The sensed voltage is compared against a threshold. If the sensed voltage is above the failure threshold for sufficient time, the diagnostic will fail.	Scaled 15V IGBT Supply Voltage	> 22.00 V	Wakeup SIgnal	ON	0.34 seconds out of a 0.42 seconds window (x of y) OR Continuous Fail Time > 0.30 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 "B" Phase U Current Low	P0A67	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.	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	RUN > 10.00 ms ≠ Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 900.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	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 "B" Phase V Current Low	P0A6A	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.	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	Run > 10.00 ms ≠ Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 900.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	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 "B" Phase W Current Low	P0A6D	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.	Peak Phase Axis Current on the W phase	< 9.00 Amps	Drive State Delay Timer Inverter State Inverter Power State Inverter Voltage Rotor Position Squared Current Comanded	Run > 10.00 ms ≠Active Discharge Normal PWM > 50.00 V -30 deg < Phase Axis < +30 deg > 900.00 Amps^2	0.4 seconds out of a 0.6 seconds window (x of y)	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 B Inverter Performance	P0A79	This diagnostic monitors the status of the IGBTs. The IGBT module will continually monitor the IGBTs for a short between the upper and lower phase. The module will then report out a status of being in a DeSat fault. If the DeSat fault status is present for sufficient time, the diagnostic will fail.	Phase A, B, or C High or Low Side IGBT	DSatFltPending (Status Fault Bit)	Wakeup Signal	ON	0.002 seconds out of a 1 seconds window (x of y)	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 "B" Phase U Current Sensor Offset Out-of Range	P0BF2	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, if the offset value is larger than the fail threshold the diagnostic will fail.	U phase offset current learn value	> 30.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fail conditions met 0.10 sec after enable conditions met	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 "B" Phase U Current Sensor Circuit Low	P0BF3	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.	U phase current sensor output at highside	< -700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 "B" Phase U Current Sensor Circuit High	P0BF4	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 temperature is above the failure threshold for sufficient time, the diagnostic will fail.	U phase current sensor output highside	> 700.00 amps	Wakeup Signal Enable Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 "B" Phase V Current Sensor Offset Out-of Range	P0BF6	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	> 30.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fai conditions met 0.10 Sec after enable conditions met	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 "B" Phase V Current Sensor Circuit Low	P0BF7	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 temperature is below the failure threshold for sufficient time, the diagnostic will fail.	V phase current sensor output at highside	< -700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 "B" Phase V Current Sensor Circuit High	P0BF8	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 temperature is above the failure threshold for sufficient time, the diagnostic will fail.	V phase current Sensor output at highside	> 700.00	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 "B" Phase W Current Sensor Offset Out-of Range	P0BFA	This diagnostic monitors the offset that is learned by the phase “W” 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.	W phase current sensor offset learn value	> 30.00 amps	Wakeup Signal Delay Timer Motor Faults Inverter Faults	On 0.10 Sec None None	Fail condidtions met 0.10 sec after enable conditoins met	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 "B" Phase W Current Sensor Circuit Low	P0BFB	This diagnostic monitors for the "W" 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 temperature is below the failure threshold for sufficient time, the diagnostic will fail.	W phase current sensor output at highside	< -700.00 amps	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 "B" Phase W Current Sensor Circuit High	P0BFC	This diagnostic monitors for the "W" 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 temperature is above the failure threshold for sufficient time, the diagnostic will fail.	W phase current sensor output at high side	> 700.00	Wakeup Signal Run Flag	On = 1.00	0.05 seconds out of a 0.1 seconds window (x of y)	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 "B" Phase U-V-W Correlation	P0BFE	This diagnostic monitors the U, V, and W phase currents for balance. The absolute value of the sum of the phase values is compared against a threshold. If the sum is above the failure threshold for sufficient time, the diagnostic will fail.	Sum of U-V-W phase currents	≥ 110.00 amps	Wakeup Signal Run Flag	On = 1.00	0.0032 seconds out of a 0.0038 seconds window (x of y)	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 "B" Phase U-V-W Current Sensor Overcurrent	P0C04	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 implements the use of 2 different fail timers, one fast and one slow. The fast timer has a very short sample window so that the diagnostic will detect a sudden fault, the slower timer has a longer sample window to allow the diagnostic to detect an intermittent fault.	U, V, or W Phase Current Sensor	> 600.00 amps	Wakeup Signal	On	0.0104 seconds out of a 0.104 seconds window (x of y) OR 0.00416 seconds out of a 0.0208 seconds window (x of y)	Type A, 1 Trips
			D Axis current less than calculated threshold determined by stator temperature listed in supporting table unless the motor temperature reading is faulted, then D Axis current threshold is determined by a default value	D-Axis Current<- 600.00 amps (faulted motor temp value) **P0C04 D-Axis Current Thresholds** (See supporting tables for expected threshold values for non-faulted motor temperature readings)	Wakeup Signal	On	0.0104 seconds out of a 0.104 seconds window (x of y) OR 0.00416 seconds out of a 0.0208 seconds window (x of y)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Drive Motor B Inverter Power Supply Circuit/Open	P0C0E	This diagnostic monitors the status of the IGBTs. The IGBT module will continuously monitor the supply circuit voltage. When the supply circuit drops below a threshold voltage the module then report out a status of being in a Bias fault. If the Bias fault status is present for sufficient time, the diagnostic will fail.	Phase A, B, or C Power Supply	Failed (Status Fault Bit)	Inverter State	Initialization Complete	0.002 seconds out of a 0.024 seconds window (x of y)	Type A, 1 Trips

Initial Supporting table - P0C04 D-Axis Current Thresholds

Description: X-Axis is stator temperature, Y-Axis is current threshold for the D-Axis current

y/x	100	120	140	150	160	200	250	300	400	500
1	-539	-482	-404	-337	-310	-310	-310	-310	-310	-310

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
ABS Front Hydraulic Circuit Leak Detected	C05B0	This monitoring chekcs if the front brake circuit has a leak by comparing the wheels dynamics with the vehicle deceleration.1. A fault is set if wheels dynamics do not match the vehicle deceleration.	The wheels dynamics are not matching the vehicle deceleration	= True	Ignition key AND Antilock brake system OR EBD Braking	= On = Active = Active	1 [Sec]	Type A, 1 Trip
		This monitoring checks for a brake circuit failure at the front axle. A fault is set if the master cylinder pressure is higher than the rear axle pressure.	Pressure of Master cylinder	> Pressure of rear axle	Ignition key AND Pressure at front axle Maintain the brake pedal at a constant force	= On > 5000 Kpa = 3 Sec	0.2 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition On and apply brake pedal with a pressure at front axle higher than 5000 kpa. Maintain the brake pedal with a constant force for 3 seconds and release.					
ABS Pump Motor Calibration Not Learned	C05AE	This monitoring strategy checks if there is a 0V calibration at Sigma Delta Modulator (SDM).The motor measuring units through a SDM require a 0V calibration. The measured SDM 0V calibration values are compared. A fault is set if the measured voltages are outside of a calibrated range.	Raw generator voltage Ugen OR Raw generator voltage Ugen AND Raw voltage drops at hydraulic pump motor relay URdsON OR Raw voltage drops at hydraulic pump motor relay URdsON	< 14 V > 23.8 V < 13 V > 18 V	Ignition key AND System voltage AND Hydraulic pump motor	= On > 6.9 V = Off	3 [Sec]	Type A, 1 Trip
		This monitoring verifies the supply voltage of the return flow pump. A supply undervoltage fault is set if the voltage of the pump motor shunt resistor is below a calibrated threshold or if the voltage of the Motor relay drain voltage is above a calibrated range, which is depending on the system voltage.	Voltage of motor shunt resistor OR Motor relay drain voltage OR Motor relay drain voltage	< 7.5 V > 3 V < 1.5 V	Ignition key AND System voltage AND Hydraulic pump motor	= On > 6.9 V = Off	2 [Sec]	Type A, 1 Trip
		DTC Pass	Accelerate vehicle to at least 18.6 mph and hold the speed for at least 20s					
ABS Pump Motor Control Circuit High	C052D	This monitoring strategy checks if there is a motor interruption or a motor relay short-circuit failure outside a motor actuation. The state of the pump motor is monitored. A fault is set if the motor voltage exceeds a calibrated threshold.	Hydraulic pump motor supply voltage	> 12 V	Hydraulic pump motor	= Off	1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
ABS Pump Motor Performance	C052B	This monitoring strategy checks if the return pump is weak due to a heavy load. A fault is set if the calculated generator voltage is over a calibrated threshold and the measured generator voltage is below the same threshold.	Calculated generator voltage AND Measured generator voltage	> 0.6 V < 0.6 V	System voltage AND Hydraulic pump motor AND Electronic Brake Control Unit state	> 6.9 V = On = Started with hardware reset	0.48 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the functionality of the hydraulic pump motor path. A fault is set if the voltage drop over the motor relay stays below a calibrated threshold when the motor relay (MR) is switched on.	Voltage drops at hydraulic pump motor relay AND Motor relay switched on	< 2 V = True	System voltage AND Vehicle speed AND Hydraulic pump motor	> 6.9 V > 9.32 mph = Off	5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the hydraulic pump motor can be actuated and if the generated motor voltage is visible to the microcontroller. The pump motor is actuated, and both the analog and digital feedback voltage signals are monitored. A fault is set if the analog or digital pump motor voltage is below a calibrated threshold.	Analog pump motor voltage OR Digital pump motor voltage	< 1.7 V < 1.7 V	Ignition key	= On	5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the motor voltage is incorrect. The Motor Voltage Comparison Test triggers a predetermined number of measurements in normal mode to give the motor voltage comparison monitor the chance to detect failures. To do this, it switches the motor voltage to UBMR (Battery Motor Relay) voltage and compares the analog UBMR voltage read in by the Analog Digital Converter (ADC) with the digital UBMR voltage calculated by the Application Specific Integrated Circuit (ASIC) while the hydraulic pump is not active. A fault is set if the deviation between the UBMR voltage read by the ADC (analog) and the UBMR voltage calculated by the ASIC (digital) exceeds a calibrated threshold.	Motor relay supply line voltage read by ADC (analog) / Motor relay supply line voltage calculated by ASIC (digital)	> 0.25	Ignition key AND Hydraulic pump motor	= On = On	2 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking. Accelerate vehicle to at least 37.3 mph and hold the speed for at least 7s					
ABS Pump Motor Supply Circuit	C052F	This monitoring strategy checks if an interruption of the motor relay voltage supply line has occured. This can be caused by a defective fuse, a bad or broken car wire harness, or even by very deep undervoltage at the motor relay voltage supply line. A fault is set if the supply line voltage (UBMR) drops below a calibrated threshold.	Motor relay supply voltage	< 1.955 V	Ignition key	= On	0.1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
ABS Pump Motor Supply Voltage "A" Circuit Low	C055B	This monitoring strategy checks if there is a possible inline resistor or undervoltage situation in the motor relay supplier. This is a check to ensure that the Application Specific Integrated Circuit (ASIC) register bit is set whenever there is an MRDSupplyFailure and is not reset throughout the ignition cycle, even if the voltage is recovered. A fault is set if during return flow pump actuation, the motor relay battery voltage drops below a calibrated threshold.	Motor relay voltage / internal supply voltage	< 0.4	Hydraulic pump motor AND Ignition key AND Vehicle speed	= On = On > 23.6 mph	0.01 [Sec]	Special Type C
		This monitoring strategy checks if there are failures on the motor supply line (for example: interruptions of UBMR). An Application Specific Integrated Circuit (ASIC) compares the voltage at UBMR with an internal dependent threshold provided by the hardware. A fault is set if the motor relay supply voltage is below a calibrated threshold.	Motor relay voltage / internal supply voltage	< 0.4	Ignition key	= On	0.2 [Sec]	Special Type C
		DTC Pass	Drive off, accelerate up to 37.2 mph and maintain this speed for at least 5 Sec					
ABS Rear Hydraulic Circuit Leak Detected	C05B1	This monitoring strategy checks if there is a leakage on the rear axle brake circuit. The monitor detects the variation of the rear axle pressure value during hold phases. A fault is set if the rear axle pressure decreases by more than a calibrated amount.	Calculated leakage on rear axle from the pressure variation	> 0.3 ml/Sec	System voltage Rear axle target presssure Pump motor running Vehicle speed For a cumulative duration of braking situations	> 9.6 V > 4500 kPa = False = 0 mph > 300 Sec	1[Sec]	Type A, 1 Trip
		This monitoring checks for a brake circuit failure at the rear axle. A fault is set if the master cylinder pressure is lower than the rear axle pressure.	Pressure of Master cylinder	< Pressure of rear axle	Ignition key AND Pressure at front axle Maintain the brake pedal at a constant force	= On > 5000 KPa = 3 Sec	0.2 [Sec]	Type A, 1 Trip
		DTC Pass	Turn on ignition. Constant brake pedal application during standstill for at least 3 sec. Check that the brake lights are illuminated or pressure at master cylinder > 500kpa. Release the brake pedal. Wait 5s. Constant brake pedal application during standstill for at least 3 sec. Check that the brake lights are illuminated or pressure at master cylinder > 500kpa. Release the brake pedal.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Assist Information 1 Message Counter Incorrect	C1284	This monitoring strategy checks whether the message is still alive or not. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a counter is incremented within the sending ECU. the counter value is enclosed within the message. The receiving control unit checks whether counters have been incremented. A fault is set if the counter value is not incremented.	Message 0x214 on Bus E counter halted	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the message checksum is correct. The network driver sends and receives all network messages. It also checks if the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a checksum is calculated within the sending ECU. The value of the checksum is enclosed within the message. The receiving control unit calculates the checksum again and compares it with the sent one. A fault is set if the received checksum is different from the calculated checksum.	Checksum of 0x214 on Bus E not correct	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
Brake Assist Information 2 Message Counter Incorrect	C1285	This monitoring strategy checks whether the message is still alive or not. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a counter is incremented within the sending ECU. the counter value is enclosed within the message. The receiving control unit checks whether counters have been incremented. A fault is set if the counter value is not incremented.	Message 0x219 on Bus E counter halted	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the message checksum is correct. The network driver sends and receives all network messages. It also checks if the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a checksum is calculated within the sending ECU. The value of the checksum is enclosed within the message. The receiving control unit calculates the checksum again and compares it with the sent one. A fault is set if the received checksum is different from the calculated checksum.	Checksum of 0x219 on Bus E not correct	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Blending System Performance	C05AD	This monitoring tests if the actual pressure in the boost piston is much higher than the target pressure. The cause of this fault could be an erroneously high pressure sensor value. A fault is set if the actual pressure is much higher than the target pressure in the by-wire circuit	Actual pressure	> 4000 KPa	Ignition key	= On	0,5 - 1 [Sec]	Type A, 1 Trip
		This monitoring tests if the actual pressure in the boost piston is much higher than the target pressure. The cause of this fault could be an erroneously high pressure sensor value. A fault is set if the actual pressure is much higher than the target pressure in the master cylinder.	Actual pressure	> 4000 KPa	Ignition key	= On	0,5 - 1 [Sec]	Type A, 1 Trip
		This monitoring checks if the actual pressure in the boost piston is much lower than the target pressure. The cause of this fault could be an erroneously low pressure sensor value, no pressure ot too low pressure in the accumulator, a defective pump, air in the hydraulic circuit, or a leakage in the hydraulic circuit. A fault is set if the actual pressure is much lower than the target pressure in the by-wire circuit	Actual pressure	< 1500 KPa	Ignition key	= On	0,5 - 1 [Sec]	Type A, 1 Trip
		This monitoring checks if the actual pressure in the boost piston is much lower than the target pressure. The cause of this fault could be an erroneously low pressure sensor value, no pressure ot too low pressure in the accumulator, a defective pump, air in the hydraulic circuit, or a leakage in the hydraulic circuit. A fault is set if the actual pressure is much lower than the target pressure in the master cylinder.	Actual pressure	< 1500 KPa	Ignition key	= On	0,5 - 1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn on ignition, 1. Wait 5seconds, 2. Drive up to 24.8 mph, 3. Realize a comfortable braking (about 3000 kpa at the rear axle), 4. Hold for 2 seconds and release smooth the brake pedal, 5. Wait 2seconds. Then repeat step 2 to 5 once again.					
Brake Master Cylinder Pressure Sensor 1 Circuit High Voltage	C0572	This monitoring checks if there is a short circuit between the supply voltage line and the pressure sensor signal line by comparing the signal line with the supply voltage line. Normally, the signal line maximum voltage should be lower than the supply voltage. A fault is set, if there is no difference in voltage between the signal line and the supply line.	Signal line voltage / Supply line voltage AND Signal line voltage / Supply line voltage	> 0.95 < 1.05	Ignition key	= On	0.1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Master Cylinder Pressure Sensor 1 Circuit Low Voltage	C0571	This monitoring checks if there is a short circuit between the ground and the pressure sensor signal line by comparing the signal line voltage with the ground. Normally, the signal line has a minimum voltage that is higher than the ground. A fault is set if there is no difference in voltage between the signal line and the ground.	Signal line voltage / Ground voltage AND Signal line voltage / Ground voltage	> 0.95 < 1.05	Ignition key	= On	0.1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Brake Master Cylinder Pressure Sensor 1 Circuit Performance	C0574	This monitoring strategy checks if the offset compensation of the pressure sensor is out of range. The zero-point of the pressure sensor signal is adjusted to compensate for any signal drifts. The offset compensation is only performed when the brake pedal is not applied (corresponding to the pressure sensor zero point). A fault is set if the offset is outside a calibrated range.	Measured pressure OR Measured pressure	> 1500 KPa < -1500 KPa	System voltage AND Brake pedal is pushed AND Acceleration pedal is pushed AND Hydraulic pump motor And Vehicle speed	> 6.9 V = False = True = Off > 4.48 mph	Immediately	Type A, 1 Trip
		DTC Pass	Drive off, accelerate up to 37.2 mph and maintain this speed for at least 5s					
Brake Pressure Sensor "A" Missing Calibration	C0560	This monitoring strategy checks if the pressure sensor at the master cylinder is functioning as expected. A fault is set if the master cylinder pressure sensor test pulse voltage exceeds a calibrated threshold or if it falls below another calibrated threshold.	Master cylinder pressure sensor test pulse voltage OR Master cylinder pressure sensor test pulse voltage	> 110 % < 90 %	Vehicle acceleration AND Actual pressure of Master Cylinder AND Traction Control System AND Vehicle speed AND Anti-Lock Braking System intervention AND Vehicle Dynamics Control AND Hydraulic pump motor	= False < 150 KPa = Off < 9.32 mph = Off = Off = Off	Immediately	Type A, 1 Trip
		DTC Pass	Drive with more than 6.2 mph for more than 60 Sec. without pressing brake pedal and no					

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Pressure Sensor "B" Missing Calibration	C059B	This monitoring strategy checks if the rear left pressure sensor is functioning as expected. A fault is set if the master cylinder pressure sensor test pulse voltage exceeds a calibrated threshold. A fault is also set if the test pulse voltage falls below a calibrated threshold.	Rear left pressure sensor testpulse voltage OR Rear left pressure sensor testpulse voltage	> 110 % < 90 %	System Software Offset compensation of pressure sensor completed AND Actual pressure of Master Cylinder AND Traction Control System AND Anti-Lock Braking System intervention AND Vehicle Dynamics Control AND Hydraulic pump motor AND Brake light switch AND Last test pulse AND Vehicle speed OR Throttle control is pushed	= At least once < 150 kPa = Off = Off = Off = Off = Off > 30 Sec < 9.32 mph = True	Immediately	Type A, 1 Trip
		DTC Pass	Drive with more than 6.2 mph for more than 60 Sec. without pressing brake pedal and no stability control active.					
Brake Pressure Sensor / Brake Pedal Position Sensor Correlation	P05FF	This monitoring checks for hydraulic circuit failures. It will check if there is a leakage or a large amount of air in the hydraulic circuit. A fault is set if the pressure sensor value stay at zero while the pedal Travel sensor value is over a threshold.	PTS signal AND Pressure signal	> 24 mm = 0 KPa	Full system mode	= On	0.2 [Sec]	Type A, 1 Trip
		This monitoring checks a pressure sensor plausibility failure. A fault is set if the pressure sensor value is too high compared to the pedal travel sensor value.	PTS signal AND Pressure signal	= 0 mm > 25 KPa	Full system mode	= On	0.2 [Sec]	Type A, 1 Trip
		DTC Pass	The brake pedal has to be pressed for more than 1 second (the pressure should reach minimum 3000 kpa).					
Control Module Communication Chassis Expansion CAN Bus Off - Generic	U0077	The CAN (Control Area Network) bus E state is monitored periodically. A fault is set if the bus is in "Bus Off" state.	CAN bus E state	= Bus off	System voltage AND System voltage ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = True ≥ 5 Sec	0.09 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring checksthe CAN initialization function has taken too long to finish . The access to message Ram by the CAN-Core is handle through a message interface register. In each cycle a CAN register bit is checked to determine if the bit is set. A fault is set if the loop lasts longer than a threshold	Number of CAN cycles	> 1000	Ignition key	= On	0.01 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					
Control Module Communication High Speed CAN Bus Off - Generic	U0073	The CAN (Control Area Network) bus A state is monitored periodically. A fault is set if the bus is in "Bus Off" state.	CAN bus A state	= Bus off	System voltage AND System voltage ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = True ≥ 5 Sec	0.24 [Sec]	Type A, 1 Trip
		This monitoring checksthe CAN initialization function has taken too long to finish . The access to message Ram by the CAN-Core is handle through a message interface register. In each cycle a CAN register bit is checked to determine if the bit is set. A fault is set if the loop lasts longer than a threshold	Number of CAN cycles	> 1000	Ignition key	= On	0.01 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					
Control Module Internal Performance	P0606	This monitoring strategy checks for proper the CPU Compare Module functionality. The software is executed on 2 CPU cores simultaneously instruction by instruction (lock step mode). The output of both cores is compared by the CPU Compare Module. A self test runs at Init to verify that the CPU Compare Module is working properly. A fault is set if the self test failed.	Core Compare Module selfest	= failed	System voltage	> 6.9 V	Immediately	Type A, 1 Trip
		This monitoring strategy checks if there is a Central Processing Unit (CPU) exception. If a CPU exception occurs, normal program execution is no longer allowed (e.g. aborts from privileged modes). A fault is set if a data abortion, a prefetch abortion, or an undefined instruction occurs.	Data abortion occurs OR Prefetch abortion occurs OR Undefined instruction occurs	= True = True = True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the execution of a sensitive process task jitters too much. A fault is set if the real process execution time is greater than its ideal start time increased by a percentage.	The execution time of the internal system process task (non ibooster systems)	> Process Ideal Time + 5% Sec	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring checks the TPSW customer function accessibility area into the RAM. A fault is set if any customer SW variable or function tries to access outside its restricted area.	SW variable or function tries to access outside its restricted area	= True	Ignition key	= On	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the A/D-converter reference voltage is out of range. A fault is set if the ADC band gap voltage is outside the allowable range.	Analog Digital Converter voltage OR Analog Digital Converter voltage	< 1.145 V > 1.345 V	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the ECU internal electrical enable line cannot be switched on or off via the software. The electrical enable line is set directly by a microcontroller pin. When the microcontroller port changes, the enable line may take the value set by the microcontroller. If the enable line does not changen this means that the ECU enable line has shorted to the ground or to the supply voltage line (3.3V). A fault is set if the ECU internal electrical enable line value is different than the value requested from the software.	The ECU internal electrical enable line cannot be switched ON or OFF by the software	= True	System voltage AND Fail-Safe Logic Test	> 6.9 V = On	0.45 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the ECU (Electronic Control Unit) internal hydraulic enable line. A fault is set if the ECU internal electrical enable line either is shorted to ground, is shorted to the supply voltage, or cannot be switched ON or OFF by the software.	ECU internal hydraulic enable line has a short to ground OR ECU internal hydraulic enable line has a short to supply voltage (3.3V) OR The ECU internal hydraulic enable line cannot be switched ON or OFF by the software	= True = True = True	System voltage	> 6.9 V	0.45 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the enable line is set properly. After the Fail-Safe Logic Test has finished the ECU (Electronic Control Unit) internal hydraulic and electrical enable lines are monitored. It is expected that the enable lines always stay at a high level. A fault is set if an interruption (an enable line at low level) of the hydraulic or electrical enable line is detected.	ECU internal hydraulic line state For time OR ECU internal electrical line state For time	= low > 0.05 Sec = low > 0.05 Sec	System voltage	> 6.9 V	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the error pin event counter is in range. The monitor pulls the error pin to test the event counter within the system chip. To prevent an electrical shutdown (which would disturb communication) during the provoked error pin event, the electrical decouple bit is set. A fault is set if the error pin event counter does not increment, or if the decouple bit is not reset.	Error pin event counter not incremented	= True	Ignition key	= On	1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a HET exception. A fault is set if a failure is detected in the EEPROM (Electronically Erasable Programmable Read-Only Memory) cell.	Failure detected in register HET	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks for proper of the High End Timer Transfer Unit (HETTU) addressing functionality. When a pointer error is detected, the HETTU state switches to a specific value. A fault is set if the HETTU is in the pointer error state.	High End Timer Transfer Unit Status	= "pointer error"	Ignition key	= On	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks the High End Timer Transfer Unit (HETTU) internal bus. A fault is set if a bus error is detected.	High End Timer Transfer Unit Status	= "bus error"	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks the High End Timer Transfer Unit (HETTU) internal bus. A fault is set if a busy bit error is detected.	High End Timer Transfer Unit Status	= "busy bit error"	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if there was a High End Timer Transfer Unit (HETTU) exception. A fault is set if an exception occurs.	Failure detected in register INT	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks whether any tasks failed to call. A fault is set if a task did not start in the expected time.	Watchdog detects a missing task	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks the feedback of the Fail-Safe Logic Test. The Fail-Safe Logic Test tests whether the system chip switches off the gate actuation of the Booster Master Switch when it detects a missing watchdog trigger. A fault is set if the feedback shows that the valve relay gate is not switched off.	Missing watchdog trigger AND No switched off valve relay gate	= True = True	System voltage	> 6.9 V	0.45 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve relay gate actuation is properly switched off via a Serial Peripheral Interface (SPI) command during the Fail-Safe Logic Test. A fault is set if the feedback shows that the valve relay gate is not switched off.	No switch off of the valve relay gate actuation via SPI	= True	System voltage	> 6.9 V	0.45 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the watchdog fault counter of the system integrated circuit. A fault is set if the value of this error counter exceeds a threshold.	Error counter	> 3	System voltage AND	> 6.9 V	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the watchdog trigger is received as expected. An incorrect watchdog trigger signal is sent to the system chip watchdog function, which increments the watchdog error counter. A fault is set if the watchdog fault counter is not incremented.	Incorrect watchdog data sent to chip	= True	System voltage	> 6.9 V	1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the watchdog trigger is received within a certain time by the system chip. A fault is set if not all watchdog tasks are executed whithin a certain period of time.	Number of watchdog tasks done	< Number of watchdog tasks	System voltage	> 6.9 V	1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the status of the watchdog. During the initialization test the watchdog status feedback from the system chip is tested against several patterns according to the ongoing sub test. A fault is set if the watchdog status is not as expected.	Watchdog status	≠ expected watchdog status	System voltage	> 6.9 V	1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the status of the watchdog. After the initialization test has finished, the status of the watchdog is continuously monitored. A fault is set if the watchdog status is not as expected.	Watchdog status	≠ expected watchdog status	System voltage	> 6.9 V	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks for correct NMI handling. The Error Signal Module is the central module at the microcontroller level; it handles severe microcontroller core failures and peripheral failures, and coordinates the logic tests during start-up. A fault is set if the Non-Maskable Interrupt handler detects a failure during initialization tests.	Non-maskable Interrupt is detected	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if a severe microcontroller core or peripheral failure has occurred. The Error Signal Module (ESM) is the central module at the microcontroller level; it handles severe microcontroller core and peripheral failures. A fault is set when a severe microcontroller core or peripheral failure is detected.	A microcontroller core failure via Error Signal Module is detected OR Peripheral failure via ESM is detected	= True = True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks whether the HET has the proper reference signal frequency. The monitor compares the defined frequency with the actual reference signal frequency, which is calculated by the HET. A fault is set if the difference between the defined frequency and the actual frequency exceeds a threshold.	Absolute(Defined frequency - calculated frequency) / defined frequency	> 0.05	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks the Serial Peripheral Interface (SPI) functionalities and failures handling of the Application Specific Integrated Circuit (ASIC) used in the system. To do so, the SPI component provides special functions to perform the following tests : - reading from/writing to an undefined address EEPROM (Electronically Erasable Programmable Read-Only Memory) cell - writing to a non-writable EEPROM cell - reading a EEPROM cell with a parity failure during transmission - reading a EEPROM cell with a clock failure during transmission For each of these tests, a certain fault response is expected from the ASIC. A fault is set if at least one fault response is not as expected.	No or wrong error response from ASIC while reading from an undefined address register OR No or wrong error response from ASIC while writing to an undefined address register OR No or wrong error response from ASIC while writing to a non-writable register OR No or wrong error response from ASIC while reading a register with a parity error in frame 1 during transmission OR No or wrong error response from ASIC while reading a register with a parity error in frame 2 during transmission OR No or wrong error response from ASIC while reading a register with a clock failure (less clock pulses) during transmission OR No or wrong error response from ASIC while reading a register with a clock failure (more clock pulses) during transmission	= True = True = True = True = True = True = True	System voltage	> 6.9 V	immediately	Type A, 1 Trip

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		The monitoring checks the received data by the Application Specific Integrated Circuit (ASIC). The ASIC of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). A fault is set if not all data has been transmitted or received. Parity check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if the calculated parity does not match the parity bit. Bit check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if at least one bit of the actual transmitted data is not equal to the transmit bit in register. Rationality check - The ASICs of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). When ASIC detects a transmission failure, it sends an error frame via the SPI. The monitoring checks the frames transmitted via the SPI. A fault is set if an error frame is transmitted.	Length of received data OR Calculated parity of the received data OR Time out error OR Acutal transmitted bits OR Clock failure OR Error frame	≠ length of send data ≠ received parity bit = True ≠ bits in register = True = bits in register	Ignition key	= On	0.001 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a Serial Peripheral Interface (SPI) communication failure. The Application Specific Integrated Circuit (ASIC) of the system is connected to the microcontroller via a SPI. The microcontroller includes hardware monitoring of the ASIC to recognize failures of the necessary input signals. The Monitor reads the results of certain of this hardware monitoring by reading out the ASIC EEPROM (Electronically Erasable Programmable Read-Only Memory) cell via Serial Peripheral Interface. A fault is set if charge-pump failure bit, or clock-input-signal failure bit, or internal-oscillator-circuit failure bit is set.	Charge-pump failure bit is set OR Clock-input-signal failure bit is set OR Internal-oscillator-circuit failure bit is set		Ignition key AND First cyclic transmission to the ASICs occurred	= On = True	0.2 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage comparators of the Application Specific Integrated Circuit (ASIC). The ASIC has several voltage comparators to monitor the level of different voltage supplies. These comparators are tested at start-up for correct functionality, and the result of the test is stored as a EEPROM (Electronically Erasable Programmable Read-Only Memory) cell value. A fault is set if there is an error flag when the monitor reads the EEPROM cell value.	Error flag is set in a defined register	= True	System voltage	> 6.9 V	Three consecutive ignition cycles	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if there is a Serial Peripheral Interface (SPI) communication failure. The L99H01 Application Specific Integrated Circuit (ASIC) of the system is connected to the microcontroller via a SPI. The microcontroller includes hardware monitoring of the ASIC to recognize failures of the necessary input signals. The Monitor reads the results of certain of this hardware monitoring by reading out the ASIC EEPROM (Electronically Erasable Programmable Read-Only Memory) cell via Serial Peripheral Interface. A fault is set if charge-pump failure bit, or watchdog failure bit, or Thermal failure bit is set.	Charge-pump failure bit is set OR Watchdog failure bit is set OR Thermal failure bit is set	= True = True = True	Ignition key AND First cyclic transmission to the L99H01 ASICs occurred	= On = True	0.005 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a timeout of the Serial Peripheral Interface (SPI) communication to Application Specific Integrated Circuit (ASIC). The Application Specific Integrated Circuit (ASIC) of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). The goal is to monitor the duration of the SPI transmission. A fault is set if the SPI transfer to ASIC is not finished within a defined period.	Duration of SPI transfer to ASIC	> 0.005 Sec	Ignition key AND Cyclic Tasks Started	= On = True	0.01 [Sec]	Type A, 1 Trip
		The monitoring checks the received data by the Application Specific Integrated Circuit (ASIC). The ASIC of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). A fault is set if not all data has been transmitted or received. Clock Failure Check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring check for any clock failures. Frame Error Check - The ASICs of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). When ASIC detects a transmission failure, it sends an error frame via the SPI. The monitoring checks the frames transmitted via the SPI. A fault is set if an error frame is transmitted.	Clock failure OR Error frame received	= True ≠ bits in register	Ignition key AND Cyclic Tasks Started	= On = True	0.01 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a timeout of the Serial Peripheral Interface (SPI) communication to Application Specific Integrated Circuit (ASIC). The Application Specific Integrated Circuit (ASIC) of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). The goal is to monitor the duration of the SPI transmission. A fault is set if the SPI transfer to ASIC is not finished within a defined period.	Duration of SPI transfer to ASIC	> 0.005 Sec	System voltage AND Cyclic Tasks Started	> 6.9 V = True	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		The monitoring checks the received data by the Application Specific Integrated Circuit (ASIC). The ASIC of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). A fault is set if not all data has been transmitted or received. Parity check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if the calculated parity does not match the parity bit. Bit check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if at least one bit of the actual transmitted data is not equal to the transmit bit in register. Rationality check - The ASICs of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). When ASIC detects a transmission failure, it sends an error frame via the SPI. The monitoring checks the frames transmitted via the SPI. A fault is set if an error frame is transmitted.	Length of received data OR Calculated parity of the received data OR Clock failure OR Acutal transmitted bits OR Error frame received	≠ length of send data ≠ received parity bit = True ≠ bits in register ≠ bits in register	Ignition key	= On	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks for exceptions in Operating System. A fault is set if an exception occurs in the Operating System.	OS-exception occurs	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		Detection of software component internal execution errors	Internal software state type	= Invalid	Ignition key	= On	0.01 [Sec]	Type A, 1 Trip
		This monitoring checks the TPSW-PBC function accessibility area into the RAM. A fault is set if the PBC SW variable or function tries to access outside its restricted area.	PBC SW function stays within its restricted aea	= False	Ignition key	= On	0.02 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the Static Random Access Memory (SRAM) and peripheral Random Access Memory (RAM) are initialized or not. The SRAM and peripheral RAM are cleared at power-up. Then This monitoring reads every SRAM and RAM addresses. A fault is set if at least one addresses is not initialized to zero.	At least one RAM or SRAM bit	≠ 0	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks for proper pull-up resistor functionality. It monitors whether the motor relay pull-up (MRPU) switch inside the Application Specific Integrated Circuit (ASIC) is working as expected. A fault is set if the MRPU pin status does not match the selected switch state.	Motor relay pull-up pin status not correct	= True	System voltage AND Hydraulic pump motor	> 6.9 V = Off	0.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if a wrong hexfile was flashed in the AECU. The purpose of RTP pins is to do measurement of RAM variables. A fault is set if the RTP Enable pin is stuck to a high.	RTP Enable pin stuck to high	= True	Ignition key	= On	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		The System Mode Manager (SMM) asks in parallel with multiple system modes for the individual modules. To do this, it receives requests from different parts of software which are initialized at the beginning and after a while a valid value is given which is not "init" value. A fault is set if after a while one requester is still in init value.	One requester still in init value for time	> 3.6 Sec	Ignition key	= On	3.6 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the microcontroller stack has over or underflowed. During initialization, stack memory cells are set at the beginning and at the end of the stack area: these Stack memory cells are checked periodically. A fault is set if one of these Stack memory cells has been overwritten.	End-stack word overwritten OR Beginning-stack word overwritten	= True = True	Ignition key	= On	0.04 [Sec]	Type A, 1 Trip
		During system start-up, the time required to configure the application software (ASW) is monitored. A fault is set if the configuration lasts longer than a defined amount of time.	ASW configuration time	> 5 Sec	Ignition key	= On	5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks for an unsupported Bootblock and FSW clock configuration in ECU. Within an ECU, the Bootblock allows actualizing the application which is called FSW. A failure is set if the Bootblock and FSW clock settings are different.	Bootblock and FSW clock settings are different	= True	Ignition key	= On	Immediately	Type A, 1 Trip

		This monitoring strategy checks if an internal fault has occurred in the operating system. A fault is set if software interrupts have occurred but:
		- the interrupt is invalid.
		- An interrupt lock release is called without previous lock.
		- not all interrupts are released.
			Software interrupt occurred
			AND
			{
			Invalid interrupt occurred
			OR
			Interrupt lock release is called without previous lock
			OR
			Not all interrupts are released
			OR
			Interrupt lock time
			}
				= True
				
				= True
				
				= True
				
				= True
				
				> 0.001 Sec
					Ignition key	= On	Immediately	Type A, 1 Trip

		This monitoring strategy checks if interrupts are properly running. The error signal module is the central module in the microcontroller level. It handles severe microcontroller core failures or peripheral failures, and coordinates the logic tests during start-up. A fault is set if no or not expected non-maskable interrupt occurs during Init tests.	Failure detected during safety logic startup tests	= True	System voltage	> 6.9 V	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the software is properly configured for the hardware. Software version and device identifiers of the Application Specific Integrated Circuit (ASIC) and of the microcontroller are compared with the software version and identifiers of the configuration software. A fault is set if a least one ID or software version does not match.	Received ID of microcontroller is not identical with the ID stored in the software	= True	Ignition key	= On	0.03 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring checks the valve channels during the freewheeling test. This test consists of splitting up several small pulses to slowly accelerate the pump. The acceleration is slow in order to avoid noise generation. A fault is set if an unused valve channel is detected during the freewheeling test or if the Valve-Driver-ASIC (Application Specific Integrated Circuit) activation channel is defective.	Unused valve channel detected OR Valve-Driver-ASIC activation channel defect	= True = True	Ignition key AND FreeWheeling Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This is a monitoring of the Valve-Driver-ASIC (Application Specific Integrated Circuit) freewheeling path, which slowly accelerates the pump to avoid noise generation. A fault is set if the Valve-Driver-ASIC freewheeling path was activated for a longer time period than the maximum freewheeling time.	Valve-Driver-ASIC freewheeling path was activated for longer time than freewheeling time	> 0.03 Sec	Ignition key AND Valve test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve is activated properly. During an activation of all valves, the feedback gate of the Valve-Driver-ASIC (Application Specific Integrated Circuit) shows valve activation although the Hydraulic Enable of the Valve-Driver-ASIC is low with. A fault is set if the feedback duty on (Gate ON) for maximum valve actuation during testing exceeds a calibrated threshold.	Feedback duty on (Gate ON) for maximum actuation of valve under test	= 100 %	Ignition key	= On	0.005 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a pulse width modulation (PWM) failure in all 12 valves. A fault is set if the PWM check sequence is not completed during the duration of the Valve Actuation Register Test (VART).	Pulse width modulation check sequence is not completed during the running period of Valve Actuation Register Test	= True	Ignition key AND PWM Monitor OR Valve Actuation Register Test OR Vaulve Drift Check	= On = On = On = On	0.005 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the Silent Valve Driver Test (SVDT) results. SVDT is a periodic check that is initiated by the software. The test runs automatically at the Application Specific Integrated Circuit (ASIC), and in case of a positive result, feedback is sent to the software via the SPI (Serial Peripheral Interface) bus. A fault is set if successful feedback is not received from the finished Silent Valve Driver Test (VDT) via the SPI-bus.	Feedback of a successful finished Silent Valve Driver Test via SPI-bus not received	= True	Ignition key	= On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the configuration bits of the Valve-Driver-ASIC register are written correctly. A fault is set if the read data of the Application Specific Integrated Circuit (ASIC) configuration bits do not match with the corresponding written data in ASIC.	Configuration of Valve-Driver-ASIC register not correct	= True	Ignition key AND Hydraulic Enable signal high	= On = True	0.03 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the result of the built-in self-test (BIST) is correct. The built-in self-test (BIST) is an internal hardware valve driver test triggered by the software. It checks the functionality of both arithmetic logic units (ALU) of the current controller. Both ALUs are triggered by different patterns. A fault is set if the BIST results are not as expected.	Valve driver BIST result from ALU not as expected	= True	Ignition key AND BuidInSelfTest (BIST)	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the serial high end timer transmission between the microcontroller and the valve-driver has failed. A fault is set if a wrong protocol, timing deviation, or lack of data transmission is detected.	SHET protocol wrong OR Timing deviation OR No data transmission	= True = True = True	Ignition key	= On	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the VART (Valve Activation Register Test) detects an error. The internal valve driver activation registers are tested using the VART in order to detect any crosstalk or stuck situations. All the valves are opened and closed sequentially according to a matching test pattern. A valve opening draws a low valve relay current. A fault is set if an open load or under current state is not detected for each valve actuation.	Valve relay voltage / Internal supply voltage OR Valve Current	< 0.33 > 0.1 A	Ignition key	= On	140 [Sec]	Type A, 1 Trip
		This monitoring checks the plausibility of the valve activation state bit. The valve opening draws a low valve relay current. The bit should be set when the valve is off. A fault is set if the bit is set even though the ratio of valve relay output voltage (UVR) to internal supply voltage (UBVR) indicates that the valve is on.	Valve relay voltage / Internal supply voltage AND Valve actuation	> 0.5 = True	Ignition key AND Valve relay supply voltage	= On > 6.9 V	120 [Sec]	Type A, 1 Trip
		This monitoring compares the valve relay output voltage read by the Application Specific Integrated Circuit (ASIC) with the valve relay output voltage read by the Analog to Digital Converter (ADC) in order to check that the valve driver ensures circuit continuity. A fault is set if the difference between the two voltages is above a calibrated threshold	Absolute(measured ASIC voltage - read ADC voltage)	> 0.4 V	Ignition key AND SilentValveDriverTest (SVDT)	= On = On	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if a low ohmic side circuit from the valve voltage (UVR) to the supply voltage (UBVR) occurs during the resistor measurement. During this measurement, the valve relay output voltage should ideally be zero. A fault is set if UVR is higher than a calibrated threshold.	Valve relay output voltage	> 1.26 V	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if there are internal and input signal failures of the Application Specific Integrated Circuit (ASIC). The ASIC is connected to the microcontroller by Serial Peripheral Interface (SPI). The monitor reads the results of this hardware monitoring EEPROM (Electronically Erasable Programmable Read-Only Memory) cell using Serial Peripheral Interface. The bits of the EEPROM cell are set by the hardware logic “Voltage-Pre_regulator-Mode”. A fault is set if the voltage-pre-regulator-mode failure bit is set.	Voltage-pre-regulator-mode failure bit is set	= True	Ignition key	= On	0.2 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if wheel speed signals are correct. The Multiplexer IC inside the EBCU (Electronic Brake Control Unit) handles the EBCU internal transmission of the wheel speed sensor signals of all four wheels. To ensure safe EBCU internal transmission these signals are multiplexed and the multiplexed signal is sent on a separate signal path within EBCU. The Multiplexer IC signal check compares the EBCU internal signals with the multiplexed signal. A fault is set if the wheel speed signals and the multiplexed signal are not identical.	Wheel speed signal and multiplexed wheel speed sensor not identical	= True	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	dependent on vehicle speed	Type A, 1 Trip
		This monitoring strategy checks if the current wheel speed sensor configuration is correct via Serial Peripheral Interface (SPI). The system supports different wheel speed sensor configurations. A fault is set if, for a calibrated duration, there is a mismatch between the current wheel speed sensor mode software configuration (stored in a register) and the hardware configuration.	Mismatch between current WSS Mode software configuration stored in a register and the hardware configuration For time	= True > 0.1 Sec	Ignition key AND First cyclic transmission to ASIC	= On = True	0.1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is an hardware defect. The Wheel Speed Sensor (WSS) System Integrated Circuit performs a check of the WSS wirings at System start-up automatically by switching sensor supply lines separately and storing the states of input comparators in a buffer. The buffer content is then evaluated in software. A fault is set if the buffer content shows a physically impossible condition.	Detected wheel speed sensor line condition is physically impossible	= True	System voltage AND Initial wheel speed sensor hardware tests AND Started with Hardware Reset OR Started with Software Reset	> 6.9 V = On = True = True	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking. Accelerate vehicle to at least 18.6 mph and hold the speed for at least 20s.					

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

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 monitoring strategy checks if there is enough available space in the EEPROM (Electronically Erasable Programmable Read-Only Memory) to allocate a data field. A fault is set if the size of the data field is bigger than the amount of available space in EEPROM.	Data field size to allocate	> Available Space	System voltage AND Ignition key	> 6.9 V = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if it is possible to write data in persistent storage. Every write access to non-volatile memory in the EEPROM (Electronically Erasable Programmable Read-Only Memory) is protected by timeout monitoring and data verification after writing. The Persistent Data Manager checks persistent data access in EEPROM. A fault is set if a write operation occurs or if data verification after writing fails.	Writing operation AND Read data different from written data	> 0.025 Sec = True	Ignition key	= On	immediately	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Control Module Long Term Memory Reset	P0603	This monitoring checks the write result at the end of the EEPROM write procedure. A fault is set if a cell is invalid which results to a read back error after writing	Read back error	= True	Ignition key	= On		Type A, 1 Trip
		This monitoring strategy checks if the customer identifier is correct. During initialization, the persistent data manager compare the EEPROM (Electronically Erasable Programmable Read-Only Memory) cell value with the expected customer ID. A fault is set if the expected customer ID does not match the stored customer ID.	Stored customer ID	≠ expected customer ID	System voltage AND Ignition key	> 6.9 V = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the system has not found the enhanced platform software end marker, which is used to help the system find the end of the data. At ignition state, the Persistent Data Manager checks the content of the EEPROM (Electronically Erasable Programmable Read-Only Memory). A fault is set if the enhanced platform software end marker has not been found.	No enhanced platform software end marker in EEPROM	= True	System voltage AND Ignition key	> 6.9 V = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the stored data field size is correct. At ignition state, the Persistent Data Manager checks the content of the EEPROM (Electronically Erasable Programmable Read-Only Memory). A fault is set if a data field size in EEPROM does not match the corresponding data item configuration in the software.	Data field size in the EEPROM	≠ data size configuration in software	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks the reading accessibility of the EEPROM (Electronically Erasable Programmable Read-Only Memory). During initialization, the Persistent Data Manager checks the content of the EEPROM. A fault is set if an access error occurs while reading EEPROM.	Read error occurs OR Not expected Non-Markable Interrupt detected	= True = True	System voltage	> 6.9 V	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the EEPROM (Electronically Erasable Programmable Read-Only Memory) memory is readable. Besides the management of the electronic stability system the Electronic Brake Control Unit (EBCU) performs various functional checks. Initially and periodically, the memory content is checked by calculating a 64-bit CRC (Cyclic Redundancy Check) value and comparing it with the checksum generated during the software build process. This algorithm checks the complete memory content. A fault is set if it is not possible to read back data from EEPROM or if the data read back from EEPROM is not valid.	EEPROM data cannot be read OR EEPROM data not valid	= True = True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if EEPROM (Electronically Erasable Programmable Read-Only Memory) access is possible. The reference resistor is used to calculate the reference current. A fault is set if it is not possible to load the reference resistor value stored in EEPROM. In this case, the EEPROM value is defective or unreadable.	Cannot load the reference resistor value stored in the EEPROM	= True	Ignition key AND Resistor Measurement Test	= On = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the reference resistor voltage stored in EEPROM (Electronically Erasable Programmable Read-Only Memory) matches the measured resistor voltage. The reference resistor voltage is measured in the factory. A fault is set if the absolute difference between the reference resistor voltage stored in EEPROM and the measured resistor voltage exceeds a calibrated threshold.	Absolute(Reference resistor voltage stored in the EEPROM - Measured resistor voltage)	> 10 %	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitor checks the configuration of the wheel speed sensors after ignition on. The failure is do to a PDM access problem or a wrong value in the wheel speed sensor type. A falure is set if after ignition ON, the configuration of the wheel speed sensor type is not possible.	Wheel speed sensor type configuration possible	= False	Ignition key	= On	immediately	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

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 monitoring check if the Electronic Brake Control Module (EBCM) has not been programmed with calibration data set. A fault is set if the byte 5 of the internal customer data for each of the 5 calibration modules is equal to ACII D	Byte 5 of the internal customer data for each of the 5 calibration modules is equal to ACII D	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					
Control Module Random Access Memory (RAM)	P0604	This monitoring strategy checks the values of a specific RAM area. Furthermore, the address decoder is tested using test patterns to ensure bus integrity. The test writes different patterns at the addresses of this RAM area. Addresses are then read out and a signature for all the readout values is calculated. The original content in RAM is afterwards rewritten. The order of the patterns is chosen so that the signature the multibit and coupling failures can be set during the signature evaluation. A fault is set if a multibit or coupling failure is detected.	Multi-bits failure detected OR Coupling failure detected OR Address decoder test detects an error	= True = True = True	System voltage	> 6.9 V	Immediately	Type A, 1 Trip
		This monitoring strategy checks correct functionality of Random Access Memory (RAM) through a programmable Built In Self Test running in start-up phase.	Memory test fails	= True	Ignition key	= On	Immediately	Type A, 1 Trip
		This monitoring strategy checks if there is a single bit error at RAM. Because of Error Correction Code, RAM single-bit errors are always corrected. A fault is set if the number of bit errors exceeds a threshold.	Number of detected single-bit errors	> 2	Ignition key	= On	Immediately	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Control Module Read Only Memory (ROM)	P0601	This monitoring strategy checks if the CRC (Cyclic Redundancy Check) of Flash EEPROM (Electronically Erasable Programmable Read-Only Memory) is correct. Initially and periodically the complete Flash EEPROM contents are checked by calculating a CRC value and comparing it with the checksum generated during the software build process. A fault is set if a double bit error of Flash EEPROM is detected, or if more than a defined number of single bit errors are detected (otherwise, single bit errors are corrected).	Double bit error detected OR Number of detected single-bit errors	= True > 1	System voltage	> 6.9 V	Immediately, during start-up or respectively after 60 sec for cyclic flash checksum test.	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Ignition Switch - Accessory Position - Circuit Low	P2537	Detects an accessory position circuit open	Accessory .	= False	Propulsion System Active Propulsion System Active Time	= True > 0.5 Sec	0.5 [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 - Circuit High	P2535	Detects if the Run/Crank input circuit is high	Short to Battery	> 5 V	CAN Communication And ECM Run/Crank Active Data	= Enabled = False	2.5 [Sec]	Type A, 1 Trip
Ignition Switch - Circuit Low	P2534	Detects if the Run/Crank input circuit is low	Short to Ground Or Open Condition	< 2 V = True	CAN Communication And ECM Run/Crank Active Data	= Enabled = Active	2.5 [Sec]	Type A, 1 Trip
Internal Control Module A/D Processing Performance	P060B	This monitoring strategy checks the conversion time of the ADC (Analog Digital Converter). The ADC periodically reads an analog signal and converts it into digital values. Before starting a new conversion, the monitor checks that the previous conversion is finished. A fault is set if the previous conversion is not finished for a number of checks.	Number of times that the previous analog to digital conversion is not finished	> 9	Ignition key	= On	0.003 [Sec]	Type A, 1 Trip
		This monitoring strategy checks proper functionality of ADC self-test. To do this, ADC channels are switched to two predefined internal microcontroller resistors to measure defined (voltage) levels (high and low).The absolute differences between the two measurements are calculated in unit digits. A fault will be set if the difference is greater than a threshold.	Absolute(difference between the two ADC measurements)	> 540 digitSec	Ignition key	= On	0.2 [Sec]	Type A, 1 Trip
		This monitoring strategy checks for correct internal Analog Digital Converter (ADC) functionality by comparing the analog motor voltage read in by the ADC with the digital motor voltage calculated by the Application Specific Integrated Circuit (ASIC) while the hydraulic pump is active. A fault is set if the deviation between the hydraulic pump motor voltage read by the ADC (analog) and the hydraulic pump motor voltage calculated by the ASIC (digital) exceeds a calibrated threshold.	Hydraulic pump motor voltage read by ADC (analog)/hydraulic pump motor voltage calculated by ASIC (digital)	> 0.25	Ignition key AND Hydraulic pump motor	= On = On	0.04 [Sec]	Type A, 1 Trip
		DTC Pass	Drive off, accelerate up to 37.2 mph and maintain this speed for at least 5s					
Left Front Inlet Control	C0010	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
					See Disabling DTCs	Not Fault Active		
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Front Outlet Control	C0011	This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Front Wheel Speed Sensor Circuit High	C0503	This monitoring strategy checks if there is a shortcut of WSS signal line to the battery.	Voltage of WSS signal line	> 12 V	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Left Front Wheel Speed Sensor Circuit Low	C0502	This monitoring strategy checks for a line failure on the front left wheel speed sensor. In the line monitor, if a failure is detected, ASIC registers are evaluated and the corresponding failures are set. A fault is set if no precise line failure can be determine.	A failure is detected AND Wheel Speed Sensor Current Supply Line Monitoring AND Wheel Speed Sensor Voltage Monitoring AND Wheel Speed Sensor Current Signal Line Monitoring	= True = False = False = False	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the current at the supply line is below a calibrated threshold.	Sensor current at supply line	< 0.16 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Front Wheel Speed Sensor Circuit/Open	C0500	This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the sensor current at the signal line is below a calibrated threshold.	Sensor current at the signal line	< 0.0038 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Front Wheel Speed Sensor Incorrect Component Installed	C0555	This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted at the correct wheel. Since the WSS signals differ for different WSS sensor types, the EBCU (Electronic Brake Control Unit) is able to recognize incorrect WSS placement by evaluating the signal. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set If the stop pulse is missing for a calibrated period of time.	No stop pulse according to wheel speed sensor protocol detected	= True	Wheel speed sensor test completed AND Ignition key	= True = On	3 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Left Front Wheel Speed Sensor Intermittent/Erratic	C0504	This monitoring strategy checks if the High End Timer Transfer Unit (HETTU) buffer has overflowed. The HETTU buffer stores the time stamp of the wheel speed sensor outputs. This buffer has a status which tells whether the buffer can be used or not. A common PIC (Programmable Interrupt Controller) checks if the HETTU buffer is in the overflow state. In this case the buffer cannot be used because more edges occur on the wheel speed sensor channels than the buffer can store. A fault is set if the HETTU buffer is in the overflow state.	HET TU buffer state	= Overflow	Ignition key	= On	0.03 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Front Wheel Speed Sensor Range/Performance	C0501	This monitoring strategy checks if there is a defective wheel speed sensor. A fault is set if the speed of one wheel speed sensor is zero and the other wheel speed sensor speeds are above a calibrated threshold. Additionally the vehicle speed has to be above a calibrated threshold.	Speed of 1 wheel AND Speed of 3 wheels	= 0 mph > 0 mph	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention	= On = False > 11.8 mph > 6.9 V = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed sensors is defective. It can be done after standstill, start-up monitoring at low speed, as well as while driving, start-up monitoring at high speed. The main principle of the start-up monitoring is to compare the speed signal from all four wheels to each other. A fault is set if the speed of the monitored wheel is below a calibrated threshold while the speed of the other wheels is above a calibrated threshold.	FR, RL, RR Wheel speed sensor AND FL Wheel speed sensor	> 7.45 mph = 0 mph	Check at low speed: Initial vehicle speed AND Anti-Lock Braking System intervention AND Traction control system intervention OR Check at high speed: Anti-Lock Braking System intervention AND Traction control system intervention	 < 1.8 mph = False = False = False = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed signal is missing due to faulty wheel speed information. A fault is set if the wheel speed signal is missing for a calibrated duration (Δt) and the wheel deceleration is below a calibrated threshold.	No wheel speed signal for a time AND Wheel deceleration	> 0.08 Sec < 300 m/Sec^2	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention AND Hydroplanning detected	= On = False > 26.84 mph > 6.9 V = False = False	0.08 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the wheel speed sensor PWM (Pulse Width Modulation) is functioning correctly. The wheel speed sensor returns a PWM signal with a frequency which is dependent on the vehicle velocity. The vehicle velocity is determined by counting every rising-edge of the signal periodically for a fixed time. A threshold is calculated with the two last rising-edges values to filter a missing edge value due to high deceleration. A fault is set if the number of rising-edges for the next cycle is lower than this calculated threshold. This monitor uses rough road detection to distinguish gaps in the edge cycle signal caused by real faults from those caused by driving on rough roads.	Number of rising-edge per cycle	< Threshold calculated by mean of the two latest edge-cycle	Vehicle speed AND Vehicle speed AND Anti-lock Brake System Interventions AND System voltage AND Ignition key	> 6.21 mph < 37.36 mph = False > 6.9 V = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks for a discontinuous wheel speed sensor signal, caused for example by impulse wheel vibration. The vibrations induce additional frequencies to the wheel speed sensor signal. The noise monitoring consists of three checks which lead to a noise fault. The first check evaluates the acceleration of each wheel speed sensor. The second check evaluates the amplitude of the noise events. A weighing factor is calculated according to the noise amplitude value. The third check evaluates the number of edges. A fault is set if two implausible high wheel speed accelerations occur within a calibrated duration, if the wheel speed acceleration is above a calibrated threshold, if the accumulation of the weighted noise amplitude is above a calibrated threshold during the actual driving cycle, or if the number of detected edges increases above a calibrated threshold within a calibrated period of time.	Wheel acceleration AND For a calibrated number of counts For time OR Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle OR Number of detected edges increases from To For time	> 9.81 m/Sec^2 = 2 < 1.2 Sec > 500 m/Sec^2 > 4 < 3 > 5 < 0.005 Sec	System voltage AND Ignition key	> 6.9 V = On	20 [Sec]	Type A, 1 Trip
		This monitoring strategy checks each wheel speed sensor signal for implausibly high wheel speed values. A fault is set if the wheel speed signal value is above a calibrated threshold for a calibrated duration.	Measured wheel speed For time	> 183.9 mph > 5.04 Sec	System voltage AND Ignition key	> 6.9 V = On	5.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the difference between the wheel speed sensor signals is within a range. A fault is set if the difference in wheel speed between a single wheel speed sensor and all other wheel speed sensors is above a calibrated threshold. If the vehicle speed is below a calibrated value, the malfunction threshold is a fixed value. If the vehicle speed is above this calibrated value, the malfunction threshold is proportional to the actual vehicle speed.	Difference between maximum and minimum wheel speed for vehicle speed OR Difference between maximum and minimum wheel speed for vehicle speed	> 3.7 mph < 12.4 mph > 6 % > 12.4 mph	Ignition key	= On	72 [Sec]	Type A, 1 Trip

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted properly. This monitor continuously evaluates continuously the distance between the impulse wheel and the WSS. The WSS evaluates the magnetic flux density to detect an air gap failure. A fault is set if the air gap is too large which is indicated by a magnetic flux density below a calibrated threshold for a calibrated number of wheel rotations.	Magnetic flux density AND for a number of wheel rotations	< 0.0022 T > 5	Ignition key AND Wheel speed sensor test completed	= On = True	0.1 [Sec]	Type A, 1 Trip
		The monitoring checks if the stop pulse from each wheel speed sensor (WSS) is detected. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set if the Application Specific Integrated Circuit (ASIC) does not detect a stop pulse after some time and if there is no level change on the wheel speed sensor signal for some time.	No stop pulse detected For time OR No level change on signal For time	= True > 0.15 Sec = True > 3.5 Sec	Vehicle speed AND For time AND Wheel speed sensor test completed	< 1.12 mph > 10 Sec = True	3.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the supply voltage of the corresponding wheel speed sensor. Each wheel speed sensor is switched on separately. A fault is set if the sensor supply voltage is below a calibrated threshold during the initial phase.	Sensor supply voltage of the respective wheel speed sensor	< 11 V	Ignition key AND System voltage AND	= On > 6.9 V	0.035 [Sec]	Type A, 1 Trip
		DTC Pass	Accelerate vehicle to at least 37.3 mph and hold the speed for at least 7s					
Left Rear Brake Pressure Sensor Circuit High Voltage	C0576	This monitoring strategy checks if there is a short circuit to the supply voltage in the pressure sensor line. To do this, it compares the signal line voltage with the supply voltage. The signal line maximum voltage should be lower than the supply voltage. A fault is set if there is no difference in voltage between the signal line and the supply line.	Signal line voltage	> 3.3 V	Ignition key	= On	0.1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Rear Brake Pressure Sensor Circuit Low Voltage	C0575	This monitoring strategy checks if there is a short circuit to ground in the pressure sensor line. To do this, it compares the signal line voltage with the ground voltage. The signal line minimum voltage should be higher than the ground voltage. A fault is set if there is no difference in voltage between the signal line and the ground.	Signal line voltage	< 0.3 V	Ignition key	= On	0.1 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Left Rear Brake Pressure Sensor Circuit Performance	C0578	This monitoring strategy checks if the offset compensation of the pressure sensor is out of range. The zero-point of the pressure sensor signal is adjusted to compensate for any signal drifts. The offset compensation is only performed when the brake pedal is not applied (corresponding to the pressure sensor zero point). A fault is set if the offset is outside a calibrated range.	Measured pressure OR Measured pressure	> 1500 KPa < -1500 KPa	System voltage AND Brake pedal is pushed AND Acceleration pedal is pushed AND Vehicle speed	> 6.9 V = False = True > 4.47 mph	Immediately	Type A, 1 Trip
		DTC Pass	Drive off, accelerate up to 37.2 mph and maintain this speed for at least 5s					
Left Rear Inlet Control	C0018	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Rear Outlet Control	C0019	This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Left Rear Wheel Speed Sensor Circuit High	C050F	This monitoring strategy checks if there is a shortcut of WSS signal line to the battery.	Voltage of WSS signal line	> 12 V	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Rear Wheel Speed Sensor Circuit Low	C050E	This monitoring strategy checks for a line failure on the rear left wheel speed sensor. In the line monitor, if a failure is detected, ASIC registers are evaluated and the corresponding failures are set. A fault is set if no precise line failure can be determine.	A failure is detected AND Wheel Speed Sensor Current Supply Line Monitoring AND Wheel Speed Sensor Voltage Monitoring AND Wheel Speed Sensor Current Signal Line Monitoring	= True = False = False = False	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the current at the supply line is below a calibrated threshold.	Sensor current at supply line	< 0.16 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Rear Wheel Speed Sensor Circuit/Open	C050C	This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the sensor current at the signal line is below a calibrated threshold.	Sensor current at the signal line	< 0.0038 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Rear Wheel Speed Sensor Incorrect Component Installed	C0557	This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted at the correct wheel. Since the WSS signals differ for different WSS sensor types, the EBCU (Electronic Brake Control Unit) is able to recognize incorrect WSS placement by evaluating the signal. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set If the stop pulse is missing for a calibrated period of time.	No stop pulse according to wheel speed sensor protocol detected	= True	Wheel speed sensor test completed AND Ignition key	= True = On	3 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Left Rear Wheel Speed Sensor Intermittent/Erratic	C0510	This monitoring strategy checks if the High End Timer Transfer Unit (HETTU) buffer has overflowed. The HETTU buffer stores the time stamp of the wheel speed sensor outputs. This buffer has a status which tells whether the buffer can be used or not. A common PIC (Programmable Interrupt Controller) checks if the HETTU buffer is in the overflow state. In this case the buffer cannot be used because more edges occur on the wheel speed sensor channels than the buffer can store. A fault is set if the HETTU buffer is in the overflow state.	HET TU buffer state	= Overflow	Ignition key	= On	0.03 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Left Rear Wheel Speed Sensor Range/Performance	C050D	This monitoring strategy checks if there is a defective wheel speed sensor. A fault is set if the speed of one wheel speed sensor is zero and the other wheel speed sensor values are above a calibrated threshold. Additionally the vehicle speed has to be above a calibrated threshold.	Speed of 1 wheel AND Speed of 3 wheels	= 0 mph > 0 mph	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention	= On = False > 11.8 mph > 6.9 V = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed sensors is defective. It can be done after standstill, start-up monitoring at low speed, as well as while driving, start-up monitoring at high speed. The main principle of the start-up monitoring is to compare the speed signal from all four wheels to each other. A fault is set if the speed of the monitored wheel is below a calibrated threshold while the speed of the other wheels is above a calibrated threshold.	FR, FL, RR Wheel speed sensor AND RL Wheel speed sensor	> 7.45 mph = 0 mph	Check at low speed: Initial vehicle speed AND Anti-Lock Braking System intervention AND Traction control system intervention OR Check at high speed: Anti-Lock Braking System intervention AND Traction control system intervention	 < 1.8 mph = False = False = False = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed signal is missing due to faulty wheel speed information. A fault is set if the wheel speed signal is missing for a calibrated duration (Δt) and the wheel deceleration is below a calibrated threshold.	No wheel speed signal for a time AND Wheel deceleration	> 0.08 Sec < 300 m/Sec^2	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention AND Hydroplanning detected	= On = False > 26.84 mph > 6.9 V = False = False	0.08 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the wheel speed sensor PWM (Pulse Width Modulation) is functioning correctly. The wheel speed sensor returns a PWM signal with a frequency which is dependent on the vehicle velocity. The vehicle velocity is determined by counting every rising-edge of the signal periodically for a fixed time. A threshold is calculated with the two last rising-edges values to filter a missing edge value due to high deceleration. A fault is set if the number of rising-edges for the next cycle is lower than this calculated threshold. This monitor uses rough road detection to distinguish gaps in the edge cycle signal caused by real faults from those caused by driving on rough roads.	Number of rising-edge per cycle	< Threshold calculated by mean of the two latest edge-cycle	Vehicle speed AND Vehicle speed AND Anti-lock Brake System Interventions AND System voltage AND Ignition key	> 6.21 mph < 37.36 mph = False > 6.9 V = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks for a discontinuous wheel speed sensor signal, caused for example by impulse wheel vibration. The vibrations induce additional frequencies to the wheel speed sensor signal. The noise monitoring consists of three checks which lead to a noise fault. The first check evaluates the acceleration of each wheel speed sensor. The second check evaluates the amplitude of the noise events. A weighing factor is calculated according to the noise amplitude value. The third check evaluates the number of edges. A fault is set if two implausible high wheel speed accelerations occur within a calibrated duration, if the wheel speed acceleration is above a calibrated threshold, if the accumulation of the weighted noise amplitude is above a calibrated threshold during the actual driving cycle, or if the number of detected edges increases above a calibrated threshold within a calibrated period of time.	Wheel acceleration AND For a calibrated number of counts For time OR Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle OR Number of detected edges increases from To For time	> 9.81 m/Sec^2 = 2 < 1.2 Sec > 500 m/Sec^2 > 4 < 3 > 5 < 0.005 Sec	System voltage AND Ignition key	> 6.9 V = On	20 [Sec]	Type A, 1 Trip
		This monitoring strategy checks each wheel speed sensor signal for implausibly high wheel speed values. A fault is set if the wheel speed signal value is above a calibrated threshold for a calibrated duration.	Measured wheel speed For time	> 183.9 mph > 5.04 Sec	System voltage AND Ignition key	> 6.9 V = On	5.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the difference between the wheel speed sensor signals is within a range. A fault is set if the difference in wheel speed between a single wheel speed sensor and all other wheel speed sensors is above a calibrated threshold. If the vehicle speed is below a calibrated value, the malfunction threshold is a fixed value. If the vehicle speed is above this calibrated value, the malfunction threshold is proportional to the actual vehicle speed.	Difference between maximum and minimum wheel speed for vehicle speed OR Difference between maximum and minimum wheel speed for vehicle speed	> 3.7 mph < 12.4 mph > 6 % > 12.4 mph	Ignition key	= On	72 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted properly. This monitor continuously evaluates continuously the distance between the impulse wheel and the WSS. The WSS evaluates the magnetic flux density to detect an air gap failure. A fault is set if the air gap is too large which is indicated by a magnetic flux density below a calibrated threshold for a calibrated number of wheel rotations.	Magnetic flux density AND for a number of wheel rotations	< 0.0022 T > 4	Ignition key AND Wheel speed sensor test completed	= On = True	0.1 [Sec]	Type A, 1 Trip
		The monitoring checks if the stop pulse from each wheel speed sensor (WSS) is detected. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set if the Application Specific Integrated Circuit (ASIC) does not detect a stop pulse after some time and if there is no level change on the wheel speed sensor signal for some time.	No stop pulse detected For time OR No level change on signal For time	= True > 0.15 Sec = True > 3.5 Sec	Vehicle speed AND For time AND Wheel speed sensor test completed	< 1.12 mph > 10 Sec = True	3.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the supply voltage of the corresponding wheel speed sensor. Each wheel speed sensor is switched on separately. A fault is set if the sensor supply voltage is below a calibrated threshold during the initial phase.	Sensor supply voltage of the respective wheel speed sensor	< 11 V	Ignition key AND System voltage AND	= On > 6.9 V	0.035 [Sec]	Type A, 1 Trip
		DTC Pass	Accelerate vehicle to at least 37.3 mph and hold the speed for at least 7s					
Lost Communication with Brake System Control Module B on Chassis Expansion Bus	U179D	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x214 not received on Bus E	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x219 not received on Bus E	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
		DTC Pass	After receving all monitored messages from the superised source					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Lost Communication with Engine Control Module	U0100	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1C5 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1F4 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0xC9 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x4C1 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	1.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x3D3 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1C3 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x2C3 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x4F1 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	2.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1C4 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x3E9 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0xAA not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0xBE not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1A3 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	5 [Sec]	Type A, 1 Trip
		DTC Pass	After receving all monitored messages from the superised source					
Lost Communication with Hybrid Powertrain Control Module	U0293	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0xD3 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1DF not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.5 [Sec]	Type A, 1 Trip
		DTC Pass	After receving all monitored messages from the superised source					
Lost Communication with Hybrid Powertrain Control Module on Chassis Expansion CAN Bus	U18B5	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x230 not received on Bus E	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type B, 2 Trips
		DTC Pass	After receving all monitored messages from the superised source					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Powertrain Control Module Indicated Requested Torque	C10EA	This monitoring strategy checks if the electric power train response(actual regenerative brake torque) does not correspond to the target regenerative brake torque, or if the signal transmission from the power train ECU (Electronic Control Unit) to the brake system ECU failed. A Fault is set if the electic power train has applied regenetive braking without the request of the brake system ECU.	(Actual regenerative brake torque signal value - Target regenerative brake torque)	> 700 Nm	Full system mode AND Regenerative braking OR Unintended regenerative braking was executed	= On = On = True	0.8 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the electric power train response(actual regenerative brake torque) does not correspond to the target regenerative brake torque, or if the signal transmission from the power train ECU (Electronic Control Unit) to the brake system ECU failed. In case of a braking situation, the ECU calculates the proportion of regenerative brake torque to non-regenerative brake torque. Then the regenerative brake torque must reach the regenerative brake torque request from the ECU. A fault is set if the actual regenerative brake torque provided by the electric power train ECU deviates by more than a certain amount from the target regenerative brake torque requested by the brake system.	(Actual regenerative brake torque signal value - Target regenerative brake torque)	> 700 Nm	Full system mode AND Regenerative braking is being requested OR Response of electicpowertrain does not match request	= On = True = True	0.8 [Sec]	Type A, 1 Trip
		DTC Pass	Turn on ignition. 1. Accelerate moderate to 24.8 mph and Brake to standstill with low decelerataion (brake time about 15sec), 2. Accelerate moderate to 24.8 mph and Brake to standstill with middle decelerataion (brake time about 7.5sec), 3. Accelerate moderate to 24.8 mph and Brake to standstill with low decelerataion (brake time about 15sec), 4. Accelerate moderate to 24.8 mph and Brake to standstill with middle decelerataion (brake					
Pump Motor Relay Circuit High	C106B	This monitoring strategy checks if the hydraulic pump has an electrical fault. When the pump is not running. The monitor checks the voltage difference between MRD and MRS voltage and the current across the motor while the pump is activated, A fault is set if the voltage is greater than a calibrated threshold.	During motor actuation. Absolute (Hydraulic pump motor relay drain voltage - hydraulic pump motor relay source voltage)	 > 2 V	Ignition key AND Hydraulic pump motor AND System voltage	= On = On > 6.9 V	0.06 [Sec]	Type A, 1 Trip
		DTC Pass	Drive off, accelerate up to 37.2 mph and maintain this speed for at least 5s					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Pump Motor Relay Circuit Low	C106A	This monitoring strategy checks if there is an overload situation on the motor relay during actuation. A fault is set if the hydraulic pump motor relay cannot be switched-through completely. This happens when the voltage between the Motor Relay Drain (MRD) and the Motor Relay Source (MRS) is greater than a calibrated threshold.	During motor actuation. Absolute (Hydraulic pump motor relay drain voltage - hydraulic pump motor relay source voltage)	> 0.5 V	Ignition key AND Hydraulic pump motor AND System voltage	= On = On > 6.9 V	0.06 [Sec]	Type A, 1 Trip
		DTC Pass	Drive off, accelerate up to 37.2 mph and maintain this speed for at least 5s					
Regenerative Braking Axle Torque Achieved Message Counter Incorrect	C1287	This monitoring strategy checks whether the message is still alive or not. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a counter is incremented within the sending ECU. the counter value is enclosed within the message. The receiving control unit checks whether counters have been incremented. A fault is set if the counter value is not incremented.	Message 0x230 on Bus E counter halted	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type B, 2 Trips
		This monitoring strategy checks if the message checksum is correct. The network driver sends and receives all network messages. It also checks if the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a checksum is calculated within the sending ECU. The value of the checksum is enclosed within the message. The receiving control unit calculates the checksum again and compares it with the sent one. A fault is set if the received checksum is different from the calculated checksum.	Checksum of 0x230 on Bus E not correct	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [Sec]	Type B, 2 Trips
Right Front Inlet Control	C0014	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Front Outlet Control	C0015	This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Front Wheel Speed Sensor Circuit High	C0509	This monitoring strategy checks if there is a shortcut of WSS signal line to the battery.	Voltage of WSS signal line	> 12 V	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Front Wheel Speed Sensor Circuit Low	C0508	This monitoring strategy checks for a line failure on the front right wheel speed sensor. In the line monitor, if a failure is detected, ASIC registers are evaluated and the corresponding failures are set. A fault is set if no precise line failure can be determine.	A failure is detected AND Wheel Speed Sensor Current Supply Line Monitoring AND Wheel Speed Sensor Voltage Monitoring AND Wheel Speed Sensor Current Signal Line Monitoring	= True = False = False = False	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the current at the supply line is below a calibrated threshold.	Sensor current at supply line	< 0.16 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Right Front Wheel Speed Sensor Circuit/Open	C0506	This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the sensor current at the signal line is below a calibrated threshold.	Sensor current at the signal line	< 0.0038 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Front Wheel Speed Sensor Incorrect Component Installed	C0556	This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted at the correct wheel. Since the WSS signals differ for different WSS sensor types, the EBCU (Electronic Brake Control Unit) is able to recognize incorrect WSS placement by evaluating the signal. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set If the stop pulse is missing for a calibrated period of time.	No stop pulse according to wheel speed sensor protocol detected	= True	Wheel speed sensor test completed AND Ignition key	= True = On	3 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Front Wheel Speed Sensor Intermittent/Erratic	C050A	This monitoring strategy checks if the High End Timer Transfer Unit (HETTU) buffer has overflowed. The HETTU buffer stores the time stamp of the wheel speed sensor outputs. This buffer has a status which tells whether the buffer can be used or not. A common PIC (Programmable Interrupt Controller) checks if the HETTU buffer is in the overflow state. In this case the buffer cannot be used because more edges occur on the wheel speed sensor channels than the buffer can store. A fault is set if the HETTU buffer is in the overflow state.	HET TU buffer state	= Overflow	Ignition key	= On	0.03 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Front Wheel Speed Sensor Range/Performance	C0507	This monitoring strategy checks if there is a defective wheel speed sensor. A fault is set if the speed of one wheel speed sensor is zero and the other wheel speed sensor values are above a calibrated threshold. Additionally the vehicle speed has to be above a calibrated threshold.	Speed of 1 wheel AND Speed of 3 wheels	= 0 mph > 0 mph	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention	= On = False > 11.8 mph > 6.9 V = False	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the wheel speed sensors is defective. It can be done after standstill, start-up monitoring at low speed, as well as while driving, start-up monitoring at high speed. The main principle of the start-up monitoring is to compare the speed signal from all four wheels to each other. A fault is set if the speed of the monitored wheel is below a calibrated threshold while the speed of the other wheels is above a calibrated threshold.	FL, RL, RR Wheel speed sensor AND FR Wheel speed sensor	> 7.45 mph = 0 mph	Check at low speed: Initial vehicle speed AND Anti-Lock Braking System intervention AND Traction control system intervention OR Check at high speed: Anti-Lock Braking System intervention AND Traction control system intervention	 < 1.8 mph = False = False = False = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed signal is missing due to faulty wheel speed information. A fault is set if the wheel speed signal is missing for a calibrated duration (Δt) and the wheel deceleration is below a calibrated threshold.	No wheel speed signal for a time AND Wheel deceleration	> 0.08 Sec < 300 m/Sec^2	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention AND Hydroplanning detected	= On = False > 26.84 mph > 6.9 V = False = False	0.08 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed sensor PWM (Pulse Width Modulation) is functioning correctly. The wheel speed sensor returns a PWM signal with a frequency which is dependent on the vehicle velocity. The vehicle velocity is determined by counting every rising-edge of the signal periodically for a fixed time. A threshold is calculated with the two last rising-edges values to filter a missing edge value due to high deceleration. A fault is set if the number of rising-edges for the next cycle is lower than this calculated threshold. This monitor uses rough road detection to distinguish gaps in the edge cycle signal caused by real faults from those caused by driving on rough roads.	Number of rising-edge per cycle	< Threshold calculated by mean of the two latest edge-cycle	Vehicle speed AND Vehicle speed AND Anti-lock Brake System Interventions AND System voltage AND Ignition key	> 6.21 mph < 37.36 mph = False > 6.9 V = On	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks for a discontinuous wheel speed sensor signal, caused for example by impulse wheel vibration. The vibrations induce additional frequencies to the wheel speed sensor signal. The noise monitoring consists of three checks which lead to a noise fault. The first check evaluates the acceleration of each wheel speed sensor. The second check evaluates the amplitude of the noise events. A weighing factor is calculated according to the noise amplitude value. The third check evaluates the number of edges. A fault is set if two implausible high wheel speed accelerations occur within a calibrated duration, if the wheel speed acceleration is above a calibrated threshold, if the accumulation of the weighted noise amplitude is above a calibrated threshold during the actual driving cycle, or if the number of detected edges increases above a calibrated threshold within a calibrated period of time.	Wheel acceleration AND For a calibrated number of counts For time OR Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle OR Number of detected edges increases from To For time	> 9.81 m/Sec^2 = 2 < 1.2 Sec > 500 m/Sec^2 > 4 < 3 > 5 < 0.005 Sec	System voltage AND Ignition key	> 6.9 V = On	20 [Sec]	Type A, 1 Trip
		This monitoring strategy checks each wheel speed sensor signal for implausibly high wheel speed values. A fault is set if the wheel speed signal value is above a calibrated threshold for a calibrated duration.	Measured wheel speed For time	> 183.9 mph > 5.04 Sec	System voltage AND Ignition key	> 6.9 V = On	5.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the difference between the wheel speed sensor signals is within a range. A fault is set if the difference in wheel speed between a single wheel speed sensor and all other wheel speed sensors is above a calibrated threshold. If the vehicle speed is below a calibrated value, the malfunction threshold is a fixed value. If the vehicle speed is above this calibrated value, the malfunction threshold is proportianal to the actual vehicle speed.	Difference between maximum and minimum wheel speed for vehicle speed OR Difference between maximum and minimum wheel speed for vehicle speed	> 3.7 mph < 12.4 mph > 6 % > 12.4 mph	Ignition key	= On	72 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted properly. This monitor continuously evaluates continuously the distance between the impulse wheel and the WSS. The WSS evaluates the magnetic flux density to detect an air gap failure. A fault is set if the air gap is too large which is indicated by a magnetic flux density below a calibrated threshold for a calibrated number of wheel rotations.	Magnetic flux density AND for a number of wheel rotations	< 0.0022 T > 4	Ignition key AND Wheel speed sensor test completed	= On = True	0.1 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		The monitoring checks if the stop pulse from each wheel speed sensor (WSS) is detected. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set if the Application Specific Integrated Circuit (ASIC) does not detect a stop pulse after some time and if there is no level change on the wheel speed sensor signal for some time.	No stop pulse detected For time OR No level change on signal For time	= True > 0.15 Sec = True > 3.5 Sec	Vehicle speed AND For time AND Wheel speed sensor test completed	< 1.12 mph > 10 Sec = True	3.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the supply voltage of the corresponding wheel speed sensor. Each wheel speed sensor is switched on separately. A fault is set if the sensor supply voltage is below a calibrated threshold during the initial phase.	Sensor supply voltage of the respective wheel speed sensor	< 11 V	Ignition key AND System voltage AND	= On > 6.9 V	0.035 [Sec]	Type A, 1 Trip
		DTC Pass	Accelerate vehicle to at least 37.3 mph and hold the speed for at least 7s					
Right Rear Inlet Control	C001C	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Rear Outlet Control	C001D	This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2, or if the High Side Switch Line Loss is below a calibrated threshold, for a calibrated number of failed tests.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Right Rear Wheel Speed Sensor Circuit High	C0515	This monitoring strategy checks if there is a shortcut of WSS signal line to the battery.	Voltage of WSS signal line	> 12 V	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Rear Wheel Speed Sensor Circuit Low	C0514	This monitoring strategy checks for a line failure on the rear right wheel speed sensor. In the line monitor, if a failure is detected, ASIC registers are evaluated and the corresponding failures are set. A fault is set if no precise line failure can be determine.	A failure is detected AND Wheel Speed Sensor Current Supply Line Monitoring AND Wheel Speed Sensor Voltage Monitoring AND Wheel Speed Sensor Current Signal Line Monitoring	= True = False = False = False	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the current at the supply line is below a calibrated threshold.	Sensor current at supply line	< 0.16 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Rear Wheel Speed Sensor Circuit/Open	C0512	This monitoring strategy checks if there is an electrical failure in the wheel speed sensors. The sensor current and the sensor voltage are monitored by a comparator circuit in an ASIC (Application Specific Integrated Circuit). A fault is set if the sensor current at the signal line is below a calibrated threshold.	Sensor current at the signal line	< 0.0038 A	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.12 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Rear Wheel Speed Sensor Incorrect Component Installed	C0558	This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted at the correct wheel. Since the WSS signals differ for different WSS sensor types, the EBCU (Electronic Brake Control Unit) is able to recognize incorrect WSS placement by evaluating the signal. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set If the stop pulse is missing for a calibrated period of time.	No stop pulse according to wheel speed sensor protocol detected	= True	Wheel speed sensor test completed AND Ignition key	= True = On	3 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Right Rear Wheel Speed Sensor Intermittent/Erratic	C0516	This monitoring strategy checks if the High End Timer Transfer Unit (HETTU) buffer has overflowed. The HETTU buffer stores the time stamp of the wheel speed sensor outputs. This buffer has a status which tells whether the buffer can be used or not. A common PIC (Programmable Interrupt Controller) checks if the HETTU buffer is in the overflow state. In this case the buffer cannot be used because more edges occur on the wheel speed sensor channels than the buffer can store. A fault is set if the HETTU buffer is in the overflow state.	HET TU buffer state	= Overflow	Ignition key	= On	0.03 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Right Rear Wheel Speed Sensor Range/Performance	C0513	This monitoring strategy checks if there is a defective wheel speed sensor. A fault is set if the speed of one wheel speed sensor is zero and the other wheel speed sensor values are above a calibrated threshold. Additionally the vehicle speed has to be above a calibrated threshold.	Speed of 1 wheel AND Speed of 3 wheels	= 0 mph > 0 mph	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention	= On = False > 11.8 mph > 6.9 V = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed sensors is defective. It can be done after standstill, start-up monitoring at low speed, as well as while driving, start-up monitoring at high speed. The main principle of the start-up monitoring is to compare the speed signal from all four wheels to each other. A fault is set if the speed of the monitored wheel is below a calibrated threshold while the speed of the other wheels is above a calibrated threshold.	FR, FL, RL Wheel speed sensor AND RR Wheel speed sensor	> 7.45 mph = 0 mph	Check at low speed: Initial vehicle speed AND Anti-Lock Braking System intervention AND Traction control system intervention OR Check at high speed: Anti-Lock Braking System intervention AND Traction control system intervention	 < 1.8 mph = False = False = False = False	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the wheel speed signal is missing due to faulty wheel speed information. A fault is set if the wheel speed signal is missing for a calibrated duration (Δt) and the wheel deceleration is below a calibrated threshold.	No wheel speed signal for a time AND Wheel deceleration	> 0.08 Sec < 300 m/Sec^2	Ignition key AND Anti-Lock Braking intervention AND Vehicle speed AND System voltage AND Traction Control System Intervention AND Hydroplanning detected	= On = False > 26.84 mph > 6.9 V = False = False	0.08 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the wheel speed sensor PWM (Pulse Width Modulation) is functioning correctly. The wheel speed sensor returns a PWM signal with a frequency which is dependent on the vehicle velocity. The vehicle velocity is determined by counting every rising-edge of the signal periodically for a fixed time. A threshold is calculated with the two last rising-edges values to filter a missing edge value due to high deceleration. A fault is set if the number of rising-edges for the next cycle is lower than this calculated threshold. This monitor uses rough road detection to distinguish gaps in the edge cycle signal caused by real faults from those caused by driving on rough roads.	Number of rising-edge per cycle	< Threshold calculated by mean of the two latest edge-cycle	Vehicle speed AND Vehicle speed AND Anti-lock Brake System Interventions AND System voltage AND Ignition key	> 6.21 mph < 37.36 mph = False > 6.9 V = On	Immediately	Type A, 1 Trip
		This monitoring strategy checks for a discontinuous wheel speed sensor signal, caused for example by impulse wheel vibration. The vibrations induce additional frequencies to the wheel speed sensor signal. The noise monitoring consists of three checks which lead to a noise fault. The first check evaluates the acceleration of each wheel speed sensor. The second check evaluates the amplitude of the noise events. A weighing factor is calculated according to the noise amplitude value. The third check evaluates the number of edges. A fault is set if two implausible high wheel speed accelerations occur within a calibrated duration, if the wheel speed acceleration is above a calibrated threshold, if the accumulation of the weighted noise amplitude is above a calibrated threshold during the actual driving cycle, or if the number of detected edges increases above a calibrated threshold within a calibrated period of time.	Wheel acceleration AND For a calibrated number of counts For time OR Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle OR Number of detected edges increases from To For time	> 9.81 m/Sec^2 = 2 < 1.2 Sec > 500 m/Sec^2 > 4 < 3 > 5 < 0.005 Sec	System voltage AND Ignition key	> 6.9 V = On	20 [Sec]	Type A, 1 Trip
		This monitoring strategy checks each wheel speed sensor signal for implausibly high wheel speed values. A fault is set if the wheel speed signal value is above a calibrated threshold for a calibrated duration.	Measured wheel speed For time	> 183.9 mph > 5.04 Sec	System voltage AND Ignition key	> 6.9 V = On	5.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the difference between the wheel speed sensor signals is within a range. A fault is set if the difference in wheel speed between a single wheel speed sensor and all other wheel speed sensors is above a calibrated threshold. If the vehicle speed is below a calibrated value, the malfunction threshold is a fixed value. If the vehicle speed is above this calibrated value, the malfunction threshold is proportianal to the actual vehicle speed.	Difference between maximum and minimum wheel speed for vehicle speed OR Difference between maximum and minimum wheel speed for vehicle speed	> 3.7 mph < 12.4 mph > 6 % > 12.4 mph	Ignition key	= On	72 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the Wheel Speed Sensor (WSS) is mounted properly. This monitor continuously evaluates continuously the distance between the impulse wheel and the WSS. The WSS evaluates the magnetic flux density to detect an air gap failure. A fault is set if the air gap is too large which is indicated by a magnetic flux density below a calibrated threshold for a calibrated number of wheel rotations.	Magnetic flux density AND for a number of wheel rotations	< 0.0022 T > 4	Ignition key AND Wheel speed sensor test completed	= On = True	0.1 [Sec]	Type A, 1 Trip
		The monitoring checks if the stop pulse from the Wheel Speed Sensor of each wheel is detected. The intelligent WSS signal provides additional information (air gap) encoded in bits 0-8. Each detection event is followed by a stop pulse. A fault is set if the Application Specific Integrated Circuit (ASIC) does not detect a stop pulse after some time and if there is no level change on the wheel speed sensor signal for some time.	No stop pulse detected For time OR No level change on signal For time	= True > 0.15 Sec = True > 3.5 Sec	Vehicle speed AND For time AND Wheel speed sensor test completed	< 1.12 mph > 10 Sec = True	3.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the supply voltage of the corresponding wheel speed sensor. Each wheel speed sensor is switched on separately. A fault is set if the sensor supply voltage is below a calibrated threshold during the initial phase.	Sensor supply voltage of the respective wheel speed sensor	< 11 V	Ignition key AND System voltage AND	= On > 6.9 V	0.035 [Sec]	Type A, 1 Trip
		DTC Pass	Accelerate vehicle to at least 37.3 mph and hold the speed for at least 7s					
Software Incompatibility With Brake System Control Module "B" - Generic	U031C	This monitoring checks if there is a mismatch between the iBooster compatibilty index signal and the current configuration in ESP. A fault is set if the signal "Ebrake Assist Compatibility Index" is received with an incompatible index value.	"Ebrake Assist Compatibility Index" is received with an incompatible index value	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
System Voltage	P0560	This monitoring strategy checks if the resistance in the internal valve supply voltage (UBVR) line is faulty or too high by checking the voltage. A supply line failure is detected during the Valve Activation Supply Line Test (VAST). A fault is set if the ratio of internal valve supply voltage to system voltage is above a calibrated threshold.	Internal valve supply voltage / System voltage	> 0.25	Vehicle speed AND Ignition key AND System voltage	> 9.32 mph = On > 6.9 V	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Accelerate vehicle to at least 18.6 mph and hold the speed for at least 20s					
System Voltage High	P0563	This monitoring checks the system supply voltage. A fault is set if the voltage is greater than a calibrated threshold.	CAN supply voltage	> 17 V	Ignition key	= On	0.09 [Sec]	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the motor relay is in an overvoltage situation. This protects the hydraulic pump against overvoltage. A fault is set if the supply voltage is above a calibrated threshold.	Voltage at motor relay	> 17 V	System voltage AND Ignition key	> 6.9 V = On	1 [Sec]	Type B, 2 Trips
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					
System Voltage Low	P0562	This monitoring strategy checks if Ecu supply voltage is out of range low, which means below the HW (Hardware) switch off threshold but the HW is not switched off for the particular time. A fault is set if the Ecu supply voltage is below a threshold.	Ecu supply voltage	< 4.9 V	Ignition key	= On	0.2 [Sec]	Special Type C
		This monitoring strategy checks if the hydraulic components are in a hard undervoltage situation. A fault is set if the hydraulic supply voltage drops below a calibrated threshold.	Hydraulic supply voltage	< 6.9 V	Ignition key	= On	1 [Sec]	Special Type C
		This monitoring strategy checks the lower functional voltage range of the hydraulic components to ensure full system functionality. A fault is set if the valve voltage or the motor voltage drops below a calibrated threshold.	Valve relay voltage	< 9.4 V	Ignition key	= On	1 [Sec]	Special Type C
		This monitoring checks the system supply voltage. A fault is set if the voltage is less than a calibrated threshold.	CAN supply voltage	< 7.5 V	Ignition key	= On	0.09 [Sec]	Special Type C
		This monitoring strategy checks if there is an undervoltage of the ASIC internal Sigma Delta Modulator (SDM). This monitoring works through an ASIC which measures an undervoltage and indicates an insufficient supply voltage of sigma delta converter to the microcontroller with SPI (Serial Peripheral Interface) protocol. A fault is set if the SDM (Sigma Delta Modulator) supply voltage is below a calibrated threshold.	Sigma delta converter supply voltage	< 5.5 V	Ignition key	= On	0.01 [Sec]	Special Type C
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					
Traction Control Front Isolation Solenoid Valve Circuit	C1590	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil during the Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2 for a calibrated number of failed tests. A fault is also set if the High Side Switch Line Loss is below a calibrated threshold.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the drift effects in the hardware current controller. The current regulator inside the valve driver returns current feedback for each activated valve. A fault is set if the difference between an activated valve's measured activation (current regulator feedback) and activation calculated from the previous resistor measurement values (current pattern) is above a calibrated threshold.	Comparison of calculated current with measured current AND Comparison of calculated current with measured current	> 20 % < -20 %	Ignition key AND Vehicle speed AND Previous successful resistor measurement AND Valve Drift Check	= On > 9.32 mph = True = active	0.025 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec. Accelerate vehicle to at least 18.6 mph and hold the speed for at least 20s		d			
Traction Control Front Prime Solenoid Valve Circuit	C158F	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	(Current through the valve OR Current through the valve) AND Both for a number of failed tests	> 0.12 A < 0.085 A > 5	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND For a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance AND For a number of times	> 0.2 Of calculated resistance < -0.2 Of calculated resistance > 2	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a short circuit between valves or a defective coil during the Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failure such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2 for a calibrated number of failed tests. A fault is also set if the High Side Switch Line Loss is below a calibrated threshold.	(Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test (VART). A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation AND For a number of times	< 0.005 A > 2	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Traction Control Rear Isolation Solenoid Valve Circuit	C1592	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	Current through valve AND Current through valve AND Both for a number of failed tests	> 0.12 A < 0.085 A	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside of the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND Both for a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance	> 0.2 Of calculated resistance > -0.2 Of calculated resistance	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring checks if there is a short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failures such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2 for a calibrated number of failed tests. A fault is also set if the High Side Switch Line Loss is below a calibrated threshold_5.	Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test. A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold for a calibrated period of time.	Measured gate actuation during test actuation	< 0.005 A	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Traction Control Rear Prime Solenoid Valve Circuit	C1591	This monitoring strategy checks if the Valve-Driver-ASIC (Application Specific Integrated Circuit) FreeWheeling component is defective. A fault is set if the valve driver freewheeling cannot be switched on or off or if the trigger state is incorrect.	Freewheeling of valve driver cannot be switched OR Trigger state not correct	= True = True	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve actuation corresponds to the expected value. The basic valve monitoring is triggered by the coordinator via the control message. A fault is set if the valve actuation is different from the expected value for a calibrated period of time.	Valve actuation	≠ expected value	Ignition key AND Resistor Measurement Test	= On = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the current through a valve is too high or too low. A fault is set if the valve current is above a calibrated threshold_1 or below a calibrated threshold_2 for a calibrated number of failed tests.	Current through valve AND Current through valve AND Both for a number of failed tests	> 0.12 A < 0.085 A	Ignition key AND Leakage Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the voltage at the output Qx or at the gate to detect if the Valve-Driver-ASIC (Application Specific Integrated Circuit) output driver is not functioning correctly. All PWM (Pulse Width Modulation) signal positive edges are counted, and the low time duration is measured. The resulting value is read out via SPI (Serial Peripheral Interface). The high and low limits of the real PWM signal, which are set by the outpout driver, are calculated using the measured number of edges and the low time. The calculated high and low limits depend on the activation used. A fault is set if the current activation value is outside the calculated limits.	Measured actuation duty OR Measured actuation duty AND Both for a number of times	< Set Actuation Duty - 20% > Set Actuation Duty + 20% > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the transistor gates are set properly. Qx is the command sent to the transistor gate which commands the valve motor. The Qx monitor compares the expected value of Qx (the calculated Qx-ON/OFF value which is dependent on the current set valve activation) with the actual value of Qx (Qx-ON/OFF from the valve-related SPI (Serial Peripheral Interface) register) in order to check for correct output driver functionality (gate on/off). A fault is set if the actual Qx value does not match the expected Qx value.	(Measured Gate On Actuation Duty OR Measured Gate Off Actuation Duty) AND Both for a number of failed tests	< 95 % > 5 % > 5	Ignition key AND Resistor Measurement Test AND Leakage Test AND Valve Activation Register Test AND Silent Valve Driver Test	= On = Off = Off = Off = Off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve-related resistor value is out of range during the resistor measurement. This resistor value is calculated by taking the mean of the voltage through the resistor. A fault is set if the valve resistor value is too high or too low.	Comparison of calculated resistance and measured resistance OR Comparison of calculated resistance and measured resistance	> 0.2 Of calculated resistance > -0.2 Of calculated resistance	Ignition key AND Resistor Measurement Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring checks if there is short circuit between valves or a defective coil (due to Valve-Driver-ASIC (Application Specific Integrated Circuit) internal failures such as OpenLoad, UnderCurrent, OverCurrent, OverTemp, PGndLost or DxLost) during the Valve-Driver-ASIC Silent Valve Driver Test (SVDT). A fault is set if the ASIC current or temperature is below a calibrated threshold_1 or above a calibrated threshold_2 for a calibrated number of failed tests. A fault is also set if the High Side Switch Line Loss is below a calibrated threshold_5.	Current at ASIC OR Current at ASIC OR Temperature at ASIC OR Temperature at ASIC OR High Side Switch Line Loss) AND For a number of times	< 0.05 A > 0.14 A < 25 °C > 140 °C < 0.005 A > 2	Ignition key AND Silent Valve Driver Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring checks if the internal valve-driver-ASIC (Application Specific Integrated Circuit) register matches the current actuation during the Valve Actuation Register Test. A fault is set if the measured gate actuation duty during the test actuation exceeds a calibrated threshold.	Measured gate actuation during test actuation	< 0.005 A	Ignition key AND Valve Activation Register Test	= On = On	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the drift effects in the hardware current controller. The current regulator inside the valve driver returns current feedback for each activated valve. A fault is set if the difference between an activated valve's measured activation (current regulator feedback) and activation calculated from the previous resistor measurement values (current pattern) is above a calibrated threshold.	Comparison of calculated current with measured current AND Comparison of calculated current with measured current	> 20 % < - 20 %	Ignition key Vehicle speed AND Previous successful resistor measurement AND Valve Drift Check	= On > 9.32 mph = True = active	0.03 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec. Accelerate vehicle to at least 18.6 mph and hold the speed for at least 20s					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Valve Relay Circuit	C106D	This monitoring strategy checks if the valve relay is correctly activated by comparing the valve relay output voltage (UVR) to the supply voltage (UBVR). The valve relay is typically switched on or off during the Fail-Safe Logic Test (FSLT) to detect if the valve relay has not switched on successfully. A fault is set if the resulting ratio of UVR to UBVR is below a calibrated threshold.	Valve relay output voltage / Valve relay supply voltage	< 0.7	Ignition key AND Fail-Safe Logic Test	= On = On	0.45 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the valve relay is correctly activated by comparing the valve relay output voltage (UVR) to the valve relay supply voltage (UBVR). A fault is set if the resulting ratio is below a calibrated threshold which indicates that the valve relay has not switched on successfully.	Valve relay output voltage / Valve relay supply voltage	< 0.7	Ignition key AND Fail-Safe Logic Test is finished AND Valve relay output voltage mid level supply	= On = True = On	0.025 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Valve Relay Circuit High	C1070	This monitoring strategy checks if the valve relay output voltage (UVR) voltage is shorted to the valve relay supply voltage (UBVR), if the valve relay is stuck, or if a missing valve relay watchdog is not detected. Two separate tests check if the valve relay can be switched off. The first test checks if a missing Built In Self Test (BIST) watchdog leads to a switched off valve relay because the hydraulic state "off". The second test checks if the valve-relay-safety-switch detects a missing valve-relay-watchdog, which must lead to a switched off valve relay. During checks, the Fail-Safe Logic Test (FSLT) derives the valve relay status by comparing the valve relay supply voltage to the valve relay voltage. A fault is set if test 1 or 2 detects that the valve relay is still switched on.	Missing BIST watchdog detected OR Valve relay safety switch detects a missing valve relay watchdog	= True = True	Ignition key AND Initial Fail-Safe Logic Test is running	= On = True	0.45 [Sec]	Type A, 1 Trip
		This monitoring checks if there is a short circuit to the valve relay. All hydraulic valves are supplied with power through one relay. This relay is checked for circuit continuity. A fault is set if the valve solenoid high side voltage is above a calibrated threshold, meaning a short circuit to the battery voltage is detected. The threshold depends on the system voltage.	Valve relay solenoid low side voltage	> 4.8 V	Ignition key AND Valve relay enabled AND System voltage	= On = False > 6.9 V	0.2 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Valve Relay Circuit Low	C106F	This monitoring strategy checks if a valve relay high ohmic short to ground has occured by comparing the valve relay output voltage (UVR) to the valve relay supply voltage (UBVR). A fault is set if the resulting ratio is below a calibrated threshold which indicates that the valve relay is shorted to ground.	Valve relay output voltage / Valve relay supply voltage	< 0.3	Ignition key AND Valve relay supply voltage	= On > 6.9 V	0.2 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if there is a valve relay short to ground by comparing the valve relay output voltage (UVR) to the valve relay supply voltage (UBVR). A fault is set if the resulting ratio is below a calibrated threshold which indicates that the valve relay is shorted to ground.	Valve relay output voltage / Valve relay supply voltage	< 0.10	Ignition key AND Valve relay supply voltage	= On > 5 V	0.04 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Valve Relay Circuit Performance	C106E	This monitoring strategy checks if the supply voltage (UBVR) is too low during evaluation of failsafe logic. During an undervoltage situation, an evaluation of the valve relay safety switch test is not possible. A fault is set if the supply voltage (UBVR) is below a calibrated threshold for a calibrated period of time.	Valve relay supply line voltage For time	< 5 V > 0.5 Sec	Ignition key AND Fail-Safe Logic Test	= On = On	0.5 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Vehicle Speed - Wheel Speed Correlation	P215A	This monitoring strategy checks if the ABS (Anti-lock Brake System) is correctly triggered. Normally, an ABS intervention should be applied for limited time. A fault is set if the system detects an ABS intervention for more than a calibrated period of time.	Anti-lock Brake System intervention for a period of time	> 60 Sec	System voltage AND Electronic Brake Control Unit state	> 6.9 V = Started with hardware reset	60 [Sec]	Type A, 1 Trip
		This monitor checks the wheel speed sensor signals for not plausible or invalid signals. The failure is set if at least three Wheel Speed Sensor (WSS) failure suspicions are set (at the same time). These WSS failure suspicions are set by other wheel speed monitorings.	Wheel Speed Sensor faliure suspicions set	> 2	System voltage AND Ignition key	> 6.9 V = On	0.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if whether at one or at several wheels no impulse wheel or impulse wheels with wrong tooth-/multiple number or wheels with a different circumference are mounted. Additionally, signal-loss caused by too high airgap between sensor and impulse wheel is detected at least over time; if another plausibility monitoring wa not successful. A fault is set if an individual wheel monitor detects a deviation above a calibrated threshold but is not able to identify the faulty wheel speed sensor.	Difference between maximum and minimum wheel speed for vehicle speed OR Difference between maximum and minimum wheel speed for vehicle speed	> 3.7 mph < 12.4 mph > 6 % > 12.4 mph	Ignition key	= On	80 [Sec]	Type A, 1 Trip
		This monitoring checks for wheel speed sensor failures. A suspected wheel speed sensor failure is set if any of the following monitors set a suspected failure flag: noise monitor, slip monitor, dynamic monitor, absent signal monitor or flat tire monitor. If a wheel speed sensor failure has occured, the Traction Control System (TCS) and the valve drift check are not available. A fault is set if more than one suspected wheel speed sensor failure occur simultaneously.	Number of suspected wheel speed sensor failures in the same time	= 2	Ignition key AND System voltage AND Ignition key	= On > 6.9 V = On	0.1 [Sec]	Type A, 1 Trip

17 OBDG02 Brake System Control Module 1 (BSC1) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring checks for wheel speed sensor failures. A suspected wheel speed sensor failure is set if any of the following monitors set a suspected failure flag: noise monitor, slip monitor, dynamic monitor, absent signal monitor or flat tire monitor. If a wheel speed sensor failure has occured, the Traction Control System (TCS) and the valve drift check are not available. A fault is set if more than one suspected wheel speed sensor failure occur simultaneously for longeer than a calibrated duration.	Number of suspected wheel speed sensor failures in the same time For time	= 2 > 0.5 Sec	Ignition key AND System voltage	= On > 6.9 V	> 0.5 [Sec]	Type A, 1 Trip
		DTC Pass	Drive off and straight ahead with more than 37.2 mph for at least 40s.					
Wheel Speed Sensors Supply Circuit High	C05A3	This monitoring strategy detects wheel speed sensor supply line short to battery by monitoring reverse current.	Reverse current detected on WSS supply line for	> 3.5 Sec	Ignition key	= On	3.5 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 5sec.					
Wheel Speed Sensors Supply Circuit Low	C05A4	This monitoring strategy checks the for an undervoltage situation with the System ASIC internal hardware comparator. This comparator monitors the voltage between the wheel speed sensor (WSS) power supply line and WSS signal line. A fault is set if the voltage between the WSS power suply line and WSS signal line is under the threshold.	voltage between the WSS power suply line and WSS signal line	< 6.7 V	System voltage AND Wheel speed sensor test completed	> 6.9 V = True	0.06 [Sec]	Type A, 1 Trip
		DTC Pass	Turn ignition on and wait for at least 30sec without braking.					

17 OBDG02 Brake System Control Module 2 (BSC2) Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Booster Internal Power Driver Range/Performance	C0595	This monitoring strategy checks the ability of the Booster Master Switch to be switched correctly. This is done by checking in 3 steps: a) The booster master switch is switched on. After a defined period the test checks if the booster master switch is switched on by evaluating the ratio of Voltage Sensor 2 and Voltage Sensor 1	Voltage Sensor2 / Voltage Sensor1	< 0.88	Software State	= Init	0.015 [Sec]	Type A, 1 Trip
		b) The Booster Master Switch is switched off. After a defined period the Voltage Sensor 2 value is evaluated.	Voltage Sensor2	> 0.88 V	Software State	= Init	0.015 [Sec]	Type A, 1 Trip
		c) The booster master switch is switched on again. After a defined period the test checks if the booster master switch is switched on by evaluating the ratio of Voltage Sensor 2 and Voltage Sensor 1	Voltage Sensor2 / Voltage Sensor1	< 0.88	Software State	= Init	0.015 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Booster Motor "A" Current Sensor Circuit Range/Performance	C0596	This monitoring strategy checks the functionality of the over current detection system by switching the comparator off and on. This is done by setting the pulse width modulated signal to the minimum or maximum pulse ratio. The proper comparator switching is verified by reading back the comparator's output via a feedback line. A fault is set - if the comparator's output does not indicate the correct switch position for the current pulse ratio. - if the voltage at the Booster Master Switch UB6 is not close to zero or to the power supply battery voltage (UBB), depending on the current pulse ratio.	PWM ratio VoltageSensor 2/ VoltageSensor 1 PWM ratio VoltageSensor 2	= maximum < 0.88 = minimum > 0.88 V	Software State BMS control BMS control	= Init = switched on = swtiched off	0.03 [Sec]	Type A, 1 Trip
		This monitoring strategy checks for over current at the electric motor driver. Current through the motor driver is monitored by hardware and the feedback pin reports if over current has been detected. A fault is set if the feedback pin is at a high level.	Feedback pin level	logical high	Software State	=Init OR Running OR Shutdown	0.03 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Booster Motor "A" Performance	C0594	This monitoring strategy checks if the movement of electric motor is in proper direction. This is done by: a) Checking if the sign of the target speed matches that of the actual speed. b) Checking the changes in direction of the measured electric motor speed within a period. A counter is incremented each time a change in direction is detected.	Absolute(actual electric motor speed) Or Counter	'< 15 rad/Sec > 7	Software State Absolute(target electric motor speed) Absolute(target electric motor speed)-Absolute(actual electric motor speed)	= Running OR Shutdown > 25 rad/Sec > 15 rad/Sec	0.15 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the oscillation of the ibooster motor.A fault is set if if the sign of the actual motor speed has changed to often within a short time interval and no change of the sign of the desired speed.	sign of the actual motor speed has changed AND Sign of the desired speed has change	= True = False	Software State AND Brake Light Switch	= Running OR Shutdown = On	0.15 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is an unintended backward rotation of the ESC electric motor. The speed controller monitor detects an unintended backward rotation of the brake booster electric motor. A fault is set if the speed deviation is greater than a threshold.	target electric motor speed - Absolute(actual electric motor speed)	> 40 rad/Sec	Software State target electric motor speed actual electric motor speed	= Running OR Shutdown > 0 rpm ≤ 1 rpm	0.015 [Sec]	Type A, 1 Trip
		DTC PASS	Apply the brake pedal for about 50% for at least 1 sec and then release the brake pedal.					
Brake Booster Motor "A" Phase U-V-W Circuit Low	C0580	This monitoring strategy checks if the gate supply voltage of the electric motor bridge driver is too low. A gate under voltage protection circuit as a part of electric motor driver circuit compares the gate supply voltage of the bridge driver with the power supply of the electric motor. A fault is set if the gate supply voltage is too low compared to the power supply of the electric motor.	Voltage Sensor 2 – Gate supply voltage	> 7 V	Software State	= Running OR Shutdown	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Booster Motor "A" Phase U-V-W Circuit Range/Performance	C0582	This monitoring strategy checks if two or more gate transistors out of six of the B6-bridge are shorted to each over. One high-side transistor and one low-side transistor of different electric motor phases are switched on simultaneously (all 6 combinations will be switched once within one test execution). If two gates are shorted, one transistor switches on unintentionally, leading to a very high current. A fault is set if the current exceeds a threshold.	Current	> 150 A	Software State	= Running OR Shutdown	0.004 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Booster Motor "A" Phase U-V-W Circuit/Open	C057F	This monitoring strategy checks if MOS-FETs of electric motor driver can be controlled and actuate properly. This monitoring strategy checks if MOS-FETs of electric motor driver can be controlled and actuate properly. A fault is set if a low-side transistor is switched on and the PhaseW voltage is in range. Similarly A fault is set if a high-side transistor is switched on and the PhaseW voltage is in range.	low-side transistor PhaseW voltage / Voltage Sensor 2 OR high-side transistor PhaseW voltage / Voltage Sensor 2	switched on ≥ 0.463 switched on ≤ 0.483	Software State electric motor	= Running OR Shutdown = not controlled	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Booster Motor "A" Phase U-V-W Current High	C0590	This monitoring strategy checks if there is a positive leakage current at the electric motor driver circuit during control. Leakage current at motor driver is monitored during inactivity of half bridge. A fault is set if the leakage current is above a threshold.	Current Sensor	> 20 A	Software State electric motor	= Running OR Shutdown = controlled	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Apply the brake pedal for about 50% for at least 1 sec and then release the brake pedal.					
Brake Booster Motor "A" Phase U-V-W Current Low	C0591	This monitoring strategy checks if the leakage current at the motor is in range low. Leakage current at motor driver is monitored during inactivity of half bridge. A fault is set if the leakage current is below a threshold.	Current Sensor	< -20 A	Software State electric motor	= Running OR Shutdown = controlled	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Apply the brake pedal for about 50% for at least 1 sec and then release the brake pedal.					
Brake Booster Motor "A" Position Sensor Circuit Range/Performance	C058A	This monitoring strategy checks if the RPS1 has a gradient failure. The Electric Motor Speed is equivalent to the gradient of the rotor rotation. A fault is set if the RPS 1 gradient exceeds a threshold.	Absolute(RPS1 gradient)	> 73 °/mSec	Software State	= Running OR Shutdown	0.005 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the rationality of the measured electric motor backward stop position. At end of line, the electric motor backward stop position is stored at EEPROM. This monitor compares the measured electric motor backward stop position with the stored electric motor backward stop position. If there electric motor rotates more than a threshold value to move to backward stop position, a mechanical defect should be present. A negative deviation of expected rotation will be detected by PreDriveCheck monitor. A fault is set if the difference between the measured electric motor backward stop position and the stored electric motor backward stop position exceeds a threshold.	Absolute(measured electric motor backward stop position - stored electric motor backward stop position)	> 60 °	Software State	= Running OR Shutdown	0.005 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks for proper eBoost actuator functionality. (a) A command is sent to move the boost body to the backward bound position (housing). (b) Once the backward bound position is reached (when the boost body comes in contact with the housing), a command is sent to move the boost body forwards to the idle position. A fault is set if (a) : - the backward position is not reached within a calibrated time, depending of last post drive check. - the electric motor is rotating in the wrong direction with a speed exceeding a threshold. (b): - the idle position is not reached within a calibrated time	Absolute(electric motor speed) electric motor moving direction OR backward bound position OR idle position	> 20 rad/s opposite than controlled not reached not reached	Software State	= Init	3 [sec]	Type A, 1 Trip
		This monitoring strategy checks the rationality of RPS1. The rotor angle is calculated internally in RPS1 IC using the raw values of the X and Y direction of the magnetic field orientation after they are internally corrected (e.g. due to off-center positioning of the sensor chip in the magnetic field). This internal calculation is monitored by an redundant recalculation in eBoost ECU using the transmitted X and Y raw values and correction values delivered by the rotor position sensor 1 IC. Both rotor angles, the RPS1 delivered one and the eBoost calculated one, are compared. A fault is set if the deviation between the recalculated angle and the RPS 1 angle delivered by the rotor position Sensor 1 IC exceeds a threshold.	Absolute(measured RPS1 angle - recalculated angle)	> 7.8 °	Software State	= Running OR Shutdown	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if vector length of RPS vector does not exceed an upper threshold. A permanent magnet is located at the end of the electric motor shaft. The RPS uses the Giant Magneto Resistance (GMR) principle to measure the X and Y direction of the magnetic field. The rotor position is calculated using these raw values after they are internally corrected (e.g due to off-center positioning of the sensor chip in the magnetic field). At a given temperature, the vector length ($\sqrt{X^2 + Y^2}$) should be constant due to the defined magnetic field. Hence within the calibrated temperature range of -50°C to 150°C the vector length must lie within a defined range. A fault will be set if the calculated vector length is above a threshold.	Calculated vector length	> 20000 digits	Software State	= Running OR Shutdown	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the vector length value from the Rotor Position Sensor (RPS) is in range low. A permanent magnet is located at the end of the brake booster motor shaft. The Rotor Position Sensor (RPS) uses the Giant Magneto Resistance (GMR) principle to measure the X and Y direction of the magnetic field. The rotor position is calculated using these raw values after they are internally corrected (e.g due to off-center positioning of the sensor chip in the magnetic field). At a given temperature, the vector length ($\sqrt{X^2 + Y^2}$) should be constant due to the defined magnetic field. Hence within the calibrated temperature range of -50°C to 150°C the vector length must lie within a defined range. A fault will be set if the calculated vector length is below a threshold.	Calculated vector length	< 3922 digits	Software State	= Running OR Shutdown	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a noise in the RPS1 vector length. By design, the vector length ($\sqrt{X^2 + Y^2}$) is almost constant, but noise or failures on the X, Y or correction values might lead to an oscillation of the vector length. A high pass filter cuts unwanted high frequencies and noise. A fault will be set if the peak amplitude of the oscillation or noise of the RPS1 vector length is greater than a threshold.	Absolute(Noise amplitude)	> 190 digits	Software State	= Running OR Shutdown	0.05 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Booster Rotor Position Sensor Configuration Error	C1277	This monitoring strategy checks if the rotor position sensor IC configuration EEPROM cell is valid. The configuration EEPROM cells of the Rotor Position Sensor (RPS) integrated circuit are monitored to ensure that the original configuration does not change. A fault is set if at least one monitored bit in the rotor position sensor IC configuration EEPROM cells differs from expected value.	Bit value	≠ expected bit value	Software State	= Running OR Shutdown	0.02 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Booster Rotor Position Sensor Message Counter Incorrect	C1276	This monitoring strategy checks if all RPS (Rotor Position Sensor) data are periodically updated. For the raw values, the correction values and the rotor angle, an update-flag within the RPS safety word exists which shows if all these values are periodically updated, not updated or still in the init-state. A fault will be set if the update-flag within the RPS safety word is either "not updated" or "init".	update-flag of RPS safety word OR update-flag of RPS safety word	= NOT_UPDATED = INIT	Software State	= Running OR Shutdown	0.1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the RPS1 internal clock works properly. The life counter monitoring detects if the internal IC clock is running with the desired frequency. At each clock cycle a counter is incremented in register cell. Between two monitoring tasks, the counter is incremented in a range corresponding to the ratio of clock-frequency to monitoring-frequency. A fault will be set if the counter increment is outside the range.	Counter increment OR Counter increment	< 6 > 24	Software State	= Running OR Shutdown	0.015 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if The Cyclic Redundancy Check (CRC) is correct. A CRC is sent from the Rotor Position Sensor (RPS) IC to the eBoost ECU for all data which is checked by eBoost. A fault is set if the recalculated CRC does not match the received one.	calculated checksum	≠ received checksum	Software State	= Running OR Shutdown	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Booster Rotor Position Sensor Unexpected Reset	C1275	This monitoring strategy checks if there was an unexpected reset at RPS. According to the specification of the Rotor Position Sensor (RPS) chip, the sensor can perform a reset under specific conditions (e.g. under voltage). If a reset happens, the position of the electric motor cannot be calculated anymore. The Hardware Related Software (HSW) checks if a reset of the sensor has happened by monitoring the reset-flag in EEPROM cell. A fault is set if the reset flag is set.	Reset-flag	= 1	Software State	= Running OR Shutdown	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "A" Circuit High	P057D	This monitoring strategy checks if there is a circuit high at BPTS A. The brake pedal travel sensor signal A line monitor detects a short circuit to the supply voltage when no level change is detected for a period and logical signal level is high. A fault is set if there is a circuit high at BPTS A.	BPTS A signal line voltage AND rising or falling edge of BPTS A PWM	> 4.7 V = not detected	Software State	= Running OR Shutdown	0.03 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "A" Circuit Intermittent/Erratic	P057E	This monitoring strategy checks if there is a BPTS A gradient error. This monitoring is detecting the gradient only in backward direction. There is no definition possible, how quick a driver can push the brake pedal. Negative gradient monitoring is used to prevent mechanical defects. A fault is set if the gradient of signal A is out of range.	BPTS A gradient	< -2000 mm/Sec	Software State	= Running OR Shutdown	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "A" Circuit Low	P057C	This monitoring strategy checks if there is a circuit low at BPTS A. The brake pedal travel sensor signal A line monitor detects a short circuit to ground when no level change is detected for a period and logical signal level is low. A fault is set if there is a circuit low at BPTS A.	BPTS A signal line rising or falling edge of BPTS A PWM	< 0.3 V = not detected	Software State	= Running OR Shutdown	0.03 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "A" Circuit Range/Performance	P057B	This monitoring strategy checks if BPTS A is out of range high. A fault is set if the BPTS A is above a threshold.	BPTS A	> 47 mm	Software State	= Running OR Shutdown	0.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if BPTS A is out of range low. A fault is set if the BPTS A is above a threshold.	BPTS A	< -0.5 mm	Software State	= Running OR Shutdown	0.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a BPTS A communication fault. The brake pedal travel senor module is working with a frequency of 1 kHz. This is done by checking if - the frequency of the Pulse Width Modulated signal is in range. - the duty cycle of the Pulse Width Modulated brake of pedal position sensor A is in range. A fault is set if - the frequency is out of range. - the duty cycle of BPTS A is out of range.	BPTS A PWM frequency OR BPTS A PWM frequency OR BPTS A PWM duty cycle OR BPTS A PWM duty cycle	< 879.3 1/Sec > 1127.17 1/Sec < 7.32 % > 92.83 %	Software State	= Running OR Shutdown	0.1 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake Pedal Position Sensor "A"/"B" Correlation	P05E0	This monitoring strategy checks if there is a deviation between the two sensor channels. A fault is set if the absolute value of the difference between both signals exceeds a threshold.	Absolute(BPTS A - BPTS B) OR Absolute(BPTS A - BPTS B)	> 1 mm > 0.5 mm	BPTS A signal AND BPTS B signal OR BPTS A signal AND BPTS B signal	> 42 mm > 42 mm ≤ 42 mm ≤ 42 mm	0.5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if zero position of brake pedal is in range. The brake pedal travel sensor provides two separate signals with different transmissions and signal conditionings. This monitor checks if the arithmetic mean of BPTS A and BPTS B when brake pedal is not applied is within a tolerated range. A fault is set if the arithmetic mean of BPTS A and BPTS B Is above a threshold.	(BPTS A + BPTS B) / 2 (BPTS A + BPTS B) / 2	> 0.6 mm < 1.5 mm	Software State	= Running OR Shutdown	0.5 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait at least 60 sec with released brake pedal while the brake system and fluid has a temperature of approximately 20C					
Brake Pedal Position Sensor "B" Circuit High	P05DE	This monitoring strategy checks if there is a circuit high at BPTS B. The brake pedal travel sensor signal B line monitor detects a short circuit to the supply voltage when no level change is detected for a period and logical signal level is high. A fault is set if there is a circuit high at BPTS B.	BPTS B signal line rising or falling edge of BPTS B PWM	> 4.7 V = not detected	Software State	= Running OR Shutdown	0.03 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "B" Circuit Intermittent/Erratic	P05DF	This monitoring strategy checks if there is a BPTS B gradient error. This monitoring is detecting the gradient only in backward direction. There is no definition possible, how quick a driver can push the brake pedal. Negative gradient monitoring is used to prevent mechanical defects. A fault is set if the gradient of BPTS B is above a threshold.	BPTS B gradient	< -2000 mm/Sec	Software State	= Running OR Shutdown	0.005 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "B" Circuit Low	P05DD	This monitoring strategy checks if there is a circuit low at BPTS B. The brake pedal travel sensor signal B line monitor detects a short circuit to ground when no level change is detected for a period and logical signal level is low. A fault is set if there is a circuit low at BPTS B.	BPTS B signal line rising or falling edge of BPTS B PWM	< 0.3 V = not detected	Software State	= Running OR Shutdown	0.03 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake Pedal Position Sensor "B" Circuit Range/Performance	P05DC	This monitoring strategy checks if BPTS B is out of range high. A fault is set if the BPTS B is above a threshold.	BPTS B	> 47 mm	Software State	= Running OR Shutdown	0.04 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if BPTS B is out of range low. A fault is set if the BPTS B is above a threshold.	BPTS B	< -0.5 mm	Software State	= Running OR Shutdown	0.04 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if there is a BPTS B communication fault. The brake pedal travel senor module is working with a frequency of 1 kHz. This is done by checking if - the frequency of the Pulse Width Modulated signal is in range. - the duty cycle of the Pulse Width Modulated brake of pedal position sensor A is in range. A fault is set if - the frequency is out of range. - the duty cycle of BPTS B is out of range.	BPTS B PWM frequency OR BPTS B PWM frequency OR BPTS B PWM duty cycle OR BPTS B PWM duty cycle	< 879.3 1/Sec > 1127.17 1/Sec < 7.32 % > 92.83 %	Software State	= Running OR Shutdown	0.1 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Brake System Information 1 Message Counter Incorrect	C1278	This monitoring strategy checks whether the message is still alive or not. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a counter is incremented within the sending ECU. the counter value is enclosed within the message. The receiving control unit checks whether counters have been incremented. A fault is set if the counter value is not incremented.	Message 0x21B on Bus E counter halted	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.2 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the message checksum is correct. The network driver sends and receives all network messages. It also checks if the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a checksum is calculated within the sending ECU. The value of the checksum is enclosed within the message. The receiving control unit calculates the checksum again and compares it with the sent one. A fault is set if the received checksum is different from the calculated checksum.	Checksum of 0x21B on Bus E not correct	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.2 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Brake System Information 2 Message Counter Incorrect	C1279	This monitoring strategy checks whether the message is still alive or not. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a counter is incremented within the sending ECU. the counter value is enclosed within the message. The receiving control unit checks whether counters have been incremented. A fault is set if the counter value is not incremented.	Message 0x21E on Bus E counter halted	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.2 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the message checksum is correct. The network driver sends and receives all network messages. It also checks if the messages are correct (length, checksum, alive-counter, reception timeout). With each newly sent message a checksum is calculated within the sending ECU. The value of the checksum is enclosed within the message. The receiving control unit calculates the checksum again and compares it with the sent one. A fault is set if the received checksum is different from the calculated checksum.	Checksum of 0x21E on Bus E not correct	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.2 [Sec]	Type A, 1 Trip
Control Module Communication Chassis Expansion CAN Bus Off - Generic	U0077	The CAN (Control Area Network) bus E state is monitored periodically. A fault is set if the bus is in "Bus Off" state.	CAN bus E state	= Bus off	System voltage AND System voltage ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = True ≥ 5 Sec	0.09 [Sec]	Type A, 1 Trip
		This monitoring checks if the CAN initialization function has taken too long to finish . The access to message Ram by the CAN-Core is handle through a message interface register. In each cycle a CAN register bit is checked to determine if the bit is set. A fault is set if the loop lasts longer than a threshold	Number of CAN cycles	> 1000	Software State	= Init	0.01 [sec]	Type A, 1 Trip
Control Module Communication High Speed CAN Bus Off - Generic	U0073	The CAN (Control Area Network) bus A state is monitored periodically. A fault is set if the bus is in "Bus Off" state.	CAN bus A state	= Bus off	System voltage AND System voltage ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = True ≥ 5 Sec	0.24 [Sec]	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring checks if the CAN initialization function has taken too long to finish . The access to message Ram by the CAN-Core is handle through a message interface register. In each cycle a CAN register bit is checked to determine if the bit is set. A fault is set if the loop lasts longer than a threshold	Number of CAN cycles	> 1000	Software State	= Init	0.01 [sec]	Type B, 2 Trips
Control Module Input Power "A" Circuit High	U3502	This monitoring checks the system supply voltage. A fault is set if the voltage is greater than a calibrated threshold.	CAN supply voltage	> 16 V	Software State	= Running	0.09 [Sec]	Type B, 2 Trips
		DTC PASS	Turn ignition on and wait for at least 30sec					
Control Module Input Power "A" Circuit Low	U3501	This monitoring strategy checks if voltage sensor 3 is out of range low, which means below the HW (Hardware) switch off threshold but the HW is not switched off for the particular time. A fault is set if the voltage sensor 3 is below a threshold	Ecu supply voltage	< 4.9 V	Software State	= Running	0.2 [Sec]	Special Type C
		This monitoring checks the system supply voltage. A fault is set if the voltage is less than a calibrated threshold.	CAN supply voltage	< 7.5 V	Software State	= Running	0.09 [Sec]	Special Type C
		DTC PASS	Turn ignition on and wait for at least 30sec					
Control Module Input Power "B" Circuit/Open	U3007	A fault is set if the Voltage Sensor 1 voltage drops below a threshold.	Voltage Sensor 1	< 2 V	Software State	= Running OR Shutdown	0.1 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Control Module Input Power "B" Circuit High	U3506	This monitoring strategy checks the power supply battery (UBB) voltage. A fault is set If the UBB detection voltage is above the voltage limit for an extended period of time.	UBB AND Period of time	> 17 V = 90 Sec	Software State	= Running OR Shutdown	90 [Sec]	Type B, 2 Trips
		This monitoring strategy checks the range of the supply voltage of the complex device driver module. A fault is set if this voltage is above a calibrated threshold.	Complex device motor voltage	> 18 V	Software State	= Running OR Shutdown	1.1 [Sec]	Type B, 2 Trips
		This monitoring strategy checks the power supply battery (UBB) voltage. A fault is set if the performance is reduced due to a voltage UBB above the level 1.	UBB AND Period of time	> 16.5 V = 1.1 Sec	Software State	= Running OR Shutdown	1.1 [Sec]	Type B, 2 Trips
		DTC PASS	Turn ignition on and wait for at least 90sec					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Control Module Input Power "B" Circuit Low	U3505	This monitoring strategy checks if Voltage Sensor 1 is out of range low. A fault is set if the voltage sensor 1 is below a threshold.	Voltage Sensor 1	< 6 V	Software State	= Running OR Shutdown	30 [Sec]	Special Type C
		This monitoring strategy checks the power supply battery (UBB) voltage. A fault is set If the UBB detection voltage is below the voltage limit for an extended period of time.	UBB AND Period of time	< 9.3 V = 90 Sec	Software State	= Running OR Shutdown	90 [Sec]	Special Type C
		This monitoring strategy checks the range of the supply voltage of the complex device driver module. A fault is set if the voltage is less than a threshold.	Complex device motor voltage	< 6 V	Software State	= Running OR Shutdown	0.2 [Sec]	Special Type C
		This monitoring strategy checks the power supply battery (UBB) voltage. A fault is set if the system performance is reduced due to low voltage under level 1.	UBB	< 9.3 V	Software State	= Running OR Shutdown	0.2 [Sec]	Special Type C
		This monitoring strategy checks the power supply battery (UBB) voltage. A fault is set if the system performance is reduced due to low voltage under level 2.	UBB	< 7.5 V	Software State	= Running OR Shutdown	0.2 [Sec]	Special Type C
		DTC PASS	Turn ignition on and wait for at least 90sec					
Control Module Input Power "C" Circuit High	U350A	This monitoring strategy checks if Voltage Sensor 2 is out of range high. A fault is set if the Voltage Sensor 2 is above a threshold.	Voltage Sensor 2	> 19.8 V	Software State AND vehicle speed	= Running OR Shutdown > 4 mph	90 [Sec]	Type A, 1 Trip
		DTC PASS	Drive straight ahead for at least 3.1 mile					
Control Module Input Power "C" Circuit Low	U3509	This monitoring strategy checks if Voltage Sensor 2 is out of range low. A fault is set if the Voltage Sensor 2 is below a threshold.	Voltage Sensor 2	< 6 V	Software State AND vehicle speed	= Running OR Shutdown > 4 mph	90 [Sec]	Type A, 1 Trip
		DTC PASS	Drive straight ahead for at least 3.1 mile					
Control Module Input Power Circuit "A/B" Correlation	U3018	This monitoring checks if the battery power supply (UBB) is not too low compared to the ECU power supply to ensure a reliable switching of the Booster Master Swith. A fault is set if the difference between UBB and UB_ECU is higher than a threshold	UBB - UB_ECU	> 7 V	Software State	= Init OR Running OR Shutdown	0.01 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the battery can provide enought power to the system. The central coordinator component in Electric Brake Booster Control Module is used to coordinate some initial tests and specific cyclic Electric Brake Booster Control Module Monitoring which depends on each other. A prerequisite for all initial tests except for the failsafe logic handler test is a sufficient Electric Brake Booster Control Module Power Supply Battery UBB. If the voltage is too low, the coordinator tests are delayed. During initial phase, all tests must be done once. If the initial phase takes too long, an undervoltage situation is given. A fault is set if any tests are initially delayed.	UBB OR [UBB_ECU AND UBB-UBB_ECU] OR [UBB_ECU AND UBB-UBB_ECU]	< 6 V > 8.5 V > 3.5 V ≤ 8.5 V > 1.5 V	Software state	= Init	0.5 [sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Control Module Input Power Circuit "B/C" Correlation	U3019	This monitoring strategy checks Voltage divider drift between the booster circuit supply line (Voltage Sensor 1) and the Motor Driver supply line (Voltage Sensor 2). A fault is set if the ratio of Voltage Sensor 1 and Voltage Sensor 2is outside a range.	Voltage Sensor 2/Voltage Sensor 1 OR Voltage Sensor 2/Voltage Sensor 1	> 1.321 < 0.766	Software State	= Running OR Shutdown	2 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Control Module Internal Performance	P0606	This monitoring strategy checks the proper functionality of the CPU Compare Module. The software is executed on 2 CPU cores simultaneously instruction by instruction (lock step mode). The output of both cores is compared by the CPU Compare Module. A self test runs at Init to verify that the CPU Compare Module is working properly. A fault will be set if the selftest failed.	Core Compare Module selfest	= failed	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if there is a CPU exception. A fault is set if a data abort, a prefetch abort, or an undefined instruction occurs.	Data abort occurs OR Prefetch abort occurs OR Undefined instruction occurs	= True = True = True	Software State	= Init OR Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks if the execution of a sensitive process task jitters too much. A fault is set if the real process execution time is greater than its ideal start time increased by a percentage.	The execution time of the internal system process task (ibooster systems)	> Ideal Time + 10% s	Software State	= Init OR Running OR Shutdown	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the reference voltage of A/D-converter is out of range. A fault is set if the bandgap voltage of the ADC is outside the allowable range.	Analog Digital Converter bandgap voltage OR Analog Digital Converter bandgap voltage	< 1145 V > 1345 V	Software State	= Init OR Running OR Shutdown	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy tests whether the system chip detects a missing watchdog trigger. At Initialization, the safety controller switches off the BMS. At switched off the BMS, a watchdog trigger is expected. If this trigger is missed, A fault is set. A fault is set if BMS switched off does not set a watchdog trigger.	Watchdog trigger AND BMS gate	missed not switched off	Software State	= Init	1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the motor driver circuit is able to be switched off and on. The electric motor driver switching (on/off) is tested by the microcontroller and the safety controllers to detect any short-circuit or interruption of the enable signal line. A fault is set if the electric motor driver is not properly switched off and on.	(Command sent : AND Motor Driver) OR (Command sent : AND Motor Driver)	 switch off enabled switch on disabled	Software State	= Init	1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the error pin event counter is in range. The monitor pulls the error pin to test the event counter within the system chip. To prevent an electrical shutdown (which would disturb communication) during the provoked error pin event, the electrical decouple bit is set. A fault is set if the error pin event counter does not increment, or if the decouple bit is not reset.	Error pin event counter not incremented	= True	Software State	= Running	1 [sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a High End Timer (HET) exception. A fault is set if a failure is detected in the EEPROM cell.	Failure detected in register of High End Timer	= True	Software State	= Init OR Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks for proper of the High End Timer Transfer Unit (HETTU) addressing functionality. When a pointer error is detected, the HETTU state switches to a specific value. A fault is set if the HETTU is in the pointer error state.	High End Timer Transfer Unit Status	= "pointer error"	Software State	= Init OR Running OR Shutdown	Immediately	Type A, 1 Trip
		This monitoring strategy checks the High End Timer Transfer Unit (HETTU) internal bus. A fault is set if a bus error is detected.	High End Timer Transfer Unit Status	= "bus error"	Software State	= Init OR Running OR Shutdown	Immediately	Type A, 1 Trip
		This monitoring strategy checks the High End Timer Transfer Unit (HETTU) internal bus. A fault is set if a bus error is detected.	High End Timer Transfer Unit Status	= "busy bit error"	Software State	= Init OR Running OR Shutdown	Immediately	Type A, 1 Trip
		This monitoring strategy checks if there was a High End Timer Transfer Unit (HETTU) exception. A fault is set if an exception occurs.	Failure detected in register INT	= True	Software State	= Running	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the eBoost internal motor driver enable signal line or the electrical enable signal line are in logical low. It is expected that the enable signal lines always stay at a high voltage level (except when the SW intends a different state). A fault is set if at least one of the pins reports a logical low.	Pin level of Motor Driver enable line OR Pin level of electrical enable line	= 0 (logical low) = 0 (logical low)	Software State AND failsafe logic test	= Running OR Shutdown = Finished	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if there was a task failed to call. A fault will be set if a task did not start in the expected time.	Watchdog detects a missing task	= True	Software State	= Init OR Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks the system integrated circuit watchdog fault counter. A fault is set if this error counter exceeds a threshold.	Error counter	> 3	Software State	= Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks if the watchdog trigger is received as expected. An incorrect watchdog trigger signal is sent to the system chip watchdog function, which increments the watchdog error counter. A fault is set if the watchdog fault counter is not incremented.	Incorrect watchdog data sent to chip	= True	Software State	= Running OR Shutdown	1 [sec]	Type A, 1 Trip
		This monitoring strategy checks if all possible watchdog triggers are received within a certain time by the system chip. A fault will be set if not all watchdog tasks are done in a certain period.	Number of watchdog tasks done	< Number of watchdog tasks	Software State	= Running OR Shutdown	0.45 [Sec]	Type A, 1 Trip
		This monitoring strategy checks the status of the watchdog. During the initialization test the watchdog status feedback from the system chip is tested against several patterns according to the ongoing sub test. A fault is set if the watchdog status is not as expected.	Watchdog status	≠ expected watchdog status	Software State	= Running OR Shutdown	1 [sec]	Type A, 1 Trip
		This monitoring strategy checks the status of the watchdog. After the Init test has finished, the status of the watchdog respectively the safety logic is being continuous Monitored. A fault will be set if the status is not as expected.	Watchdog status	≠ expected watchdog status	Software State	= Running OR Shutdown	0.05 [Sec]	Type A, 1 Trip
		This monitoring strategy checks correct handling of NMI. The Error Signal Module is the central module at the microcontroller level; it handles severe microcontroller core failures or peripheral failures, and coordinates the logic tests during start-up. A fault is set if the Non-Maskable Interrupt handler detects a failure During Init tests.	Non-Maskable Interrupt occurs	= True	Software State	= Init	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if a severe microcontroller core or peripheral failure occurred. The Error Signal Module (ESM) is the central module at the microcontroller level; it handles severe microcontroller core or peripheral failures. A fault is set when severe microcontroller core or peripheral failures occurred.	A microcontroller core failure via Error Signal Module is detected OR Peripheral failure via ESM is detected	= True = True	Software State	= Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks whether the HET has the proper reference signal frequency. The monitor compares the defined frequency with the actual reference signal frequency, which is calculated by the HET. A fault is set if the difference between the defined frequency and the actual frequency exceeds a threshold.	Absolute(Defined frequency - calculated frequency) / defined frequency	> 0.05	Software State	= Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy tests the Serial Peripheral Interface (SPI) functionality and failure handling of the Application Specific Integrated Circuits (ASIC) used in the system. To do so, the SPI component provides special functions to perform the following tests : - reading from/writing to an undefined address EEPROM cell - writing to a non-writable EEPROM cell - reading a EEPROM cell with a parity failure during transmission - reading a EEPROM cell with a clock failure during transmission For each of these tests, a certain fault response is expected from the ASIC. A fault is set if at least one fault response does not match the expected one.	No or wrong fault response from ASIC while reading from an undefined address register OR No or wrong fault response from ASIC while writing to an undefined address register OR No or wrong fault response from ASIC while writing to a non-writable register OR No or wrong fault response from ASIC while reading a register with a parity error in frame 1 during transmission OR No or wrong fault response from ASIC while reading a register with a parity error in frame 2 during transmission OR No or wrong fault response from ASIC while reading a register with a clock failure (less clock pulses) during transmission OR No or wrong fault response from ASIC while reading a register with a clock failure (more clock pulses) during transmission	= True = True = True = True = True = True = True	Software State	= Init	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		The monitoring checks the received data by the Application Specific Integrated Circuit (ASIC). The ASIC of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). A fault is set if not all data has been transmitted or received. Parity check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if the calculated parity does not match the parity bit. Bit check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if at least one bit of the actual transmitted data is not equal to the transmit bit in register. Rationality check - The ASICs of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). When ASIC detects a transmission failure, it sends an error frame via the SPI. The monitoring checks the frames transmitted via the SPI. A fault is set if a wrong frame is transmitted.	Length of received data OR Calculated parity of the received data OR Time out error OR Acutal transmitted bits OR Clock failure OR Data received	≠ length of send data ≠ received parity bit = True ≠ bits in register = True ≠ bits in register	Software State	= Init OR Running	0.001 [sec]	Type A, 1 Trip
		This monitoring strategy checks if there is a Serial Peripheral Interface (SPI) communication failure. The Application Specific Integrated Circuits (ASIC) of the system are connected to the microcontroller via a SPI. The microcontroller includes hardware Monitoring of the ASIC to recognize failures of the necessary input signals. The Monitor reads the results of certain of this hardware Monitoring by reading out the ASIC EEPROM cell via Serial Peripheral Interface. A fault is set if charge-pump failure bit, or clock-input-signal failure bit, or internal-oscillator-circuit failure bit is set.	Charge-pump failure bit is set OR Clock-input-signal failure bit is set OR Internal-oscillator-circuit failure bit is set	= True = True = True	Software State	= Init	0.2 [Sec]	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks the voltage comparators of the ASIC. The Application Specific Integrated Circuit (ASIC) has several voltage comparators to monitor the level of different voltage supplies. These comparators are tested at start-up for correct functionality, and the result of the test is stored as a EEPROM cell value. A fault is set if there is an error flag when the monitor reads the EEPROM cell value.	Error flag is set in a defined register	= True	Software State	= Init	Three consecutive ignition cycles	Type A, 1 Trip
		This monitoring strategy checks if there is a timeout of the Serial Peripheral Interface (SPI) communication to Application Specific Integrated Circuit (ASIC). The Application Specific Integrated Circuit (ASIC) of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). The goal is to monitor the duration of the SPI transmission. A fault is set if the SPI transfer to ASIC is not finished within a defined period.	Duration of SPI transfer to ASIC	> 0.005 Sec	Software State	= Init	0.05 [Sec]	Type A, 1 Trip
		The monitoring checks the received data by the Application Specific Integrated Circuit (ASIC). The ASIC of the system is connected to the microcontroller via a Serial Peripheral Interface (SPI). A fault is set if not all data has been transmitted or received. Parity check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if the calculated parity does not match the parity bit. Bit check - The ASIC of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). The monitoring checks the received data by the ASIC. A fault is set if at least one bit of the actual transmitted data is not equal to the transmit bit in register. Rationality check - The ASICs of the system is connected to the microcontroller via a serial Peripheral Interface (SPI). When ASIC detects a transmission failure, it sends an error frame via the SPI. The monitoring checks the frames transmitted via the SPI. A fault is set if an error frame is transmitted.	Length of received data OR Calculated parity of the received data OR Clock failure OR Acutal transmitted bits OR Error frame received	≠ length of send data ≠ received parity bit = True ≠ bits in register ≠ bits in register	Software State	= Init OR Running OR Shutdown	0.05 [sec]	Type A, 1 Trip

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if there was an exception in Operating System. A fault is set if an exception occurs in the Operating System.	OS-exception occurs	= True	Software State	= Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks if the Static Random Access Memory (SRAM) and peripheral Random Access Memory (RAM) are initialized or not. The SRAM and peripheral RAM are cleared at power-up. Then this Monitoring reads every SRAM and RAM addresses. A fault will be set if at least one adresse is not initialized to zero.	At least one RAM or SRAM bit	≠ 0	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if a wrong hexfile was flashed in the AECU. The purpose of RTP pins is to do measurement of RAM variables. A fault is set if the RTP Enable pin is stuck to a high.	RTP Enable pin stuck to high	= True	Software State	= Init	Immediately	Type A, 1 Trip
		The System Mode Manager (SMM) asks in parallel with multiple system modes for the individual modules. To do this, it receives requests from different parts of software which are initialized at the beginning and after a while a valid value is given which is not "init" value. A fault is set if after a while one requester is still in init value.	One requester still in init value for time	> 3.6 Sec	Software State	= Running	3.6 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if the microcontroller stack has over or underflowed. During initialization, stack memory cells are set at the beginning and at the end of the stack area: these Stack memory cells are checked periodically. A fault is set if one of these Stack memory cells has been overwritten.	End-stack word overwritten OR Beginning-stack word overwritten	= True = True	Software State	= Init	0.04 [sec]	Type A, 1 Trip
		This monitoring strategy checks the time to configure the Application Software, during the system startup. A fault will be set if it lasts longer than a defined period.	ASW configuration time	> 5 Sec	Software State	= Init	5 [Sec]	Type A, 1 Trip
		This monitoring strategy checks for an unsupported Bootblock and FSW clock configuration in ECU. Within an ECU, the Bootblock allows actualizing the application which is called FSW. A failure is set if the Bootblock and FSW clock settings are different.	Bootblock and FSW clock settings are different	= True	Software State	= Init	Immediately	Type A, 1 Trip

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

		This monitoring strategy checks if an internal fault has occurred in the operating system. A fault is set if software interrupts have occurred but:
		- the interrupt is invalid.
		- An interrupt lock release is called without previous lock.
		- not all interrupts are released.
			Software interrupt occurred
			AND
			{
			Invalid interrupt occurred
			OR
			Interrupt lock release is called without previous lock
			OR
			Not all interrupts are released
			OR
			Interrupt lock time
			}
				= True
				
				= True
				
				= True
				
				= True
				
				> 0.001 Sec
					Software State	= Init OR Running OR Shutdown	Immediately	Type A, 1 Trip

		This monitoring strategy checks if interrupts are properly running. The error signal module is the central module in the microcontroller level. It handles severe microcontroller core failures or peripheral failures, and coordinates the logic tests during start-up. A fault is set if no or not expected non-maskable interrupt occurs during Init tests.	Failure detected during safety logic startup tests	= True	System voltage	> 6.9 V	Immediately	Type A, 1 Trip
		This monitoring strategy checks if the software is properly configured for the hardware. Software version and device identifiers of the Application Specific Integrated Circuit (ASIC) and of the microcontroller are compared with the software version and identifiers of the configuration software. A fault is set if a least one ID or software version does not match.	Received ID of microcontroller is not identical with the ID stored in the software	= True	Software State	Init	0.03 [sec]	Type A, 1 Trip
		This monitoring strategy checks if there are internal and input signal failures of the Application Specific Integrated Circuit (ASIC). The ASIC is connected to the microcontroller by Serial Peripheral Interface (SPI). The monitor reads the results of this hardware monitoring EEPROM cell using Serial Peripheral Interface. The bits of the EEPROM cell are set by the hardware logic “Voltage-Pre_regulator-Mode”. A fault is set if the voltage-pre-regulator-mode failure bit is set.	Voltage-pre-regulator-mode failure bit is set	= True	Software State	= Running OR Shutdown	0.2 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 30sec					
Control Module Long Term Memory Performance	P062F	This monitoring checks for a plausible EEPROM ceel defect. A fault is set if the "gap lap adjust" correction factor can not be read from the EEPROM	Gap lap adjust correction factor can not be read	= True	Software State	= Init	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks for a plausible EEPROM cell defect. A fault is set if the update of the plant Jump-In Gain adjustment failed.	Update of Plant Jump-In Gain Adjustment failed	= True	Software State	= Init	Immediately	Type A, 1 Trip
		This monitoring strategy checks if there is enough available space in the EEPROM (Electronically Erasable Programmable Read-Only Memory) to allocate a data field. A fault is set if the size of the data field is bigger than the amount of available space in EEPROM.	Data field size to allocate	> Available Space	Software State	= Init OR Running OR Shutdown	immediately	Type A, 1 Trip
		This monitoring strategy checks if it is possible to write data in persistent storage. Every write access to non-volatile memory in the EEPROM (Electronically Erasable Programmable Read-Only Memory) is protected by timeout monitoring and data verification after writing. The Persistent Data Manager checks persistent data access in EEPROM. A fault is set if a write operation occurs or if data verification after writing fails.	Writing operation	> 0.025 Sec	Software State	= Running	immediately	Type A, 1 Trip
		This monitoring strategy check if the the Master Cylinder pressure sensor offset can be written. A fault is set if the value can not be written in the EEPROM during postrun	write failure occured	= True	Software State	= Shutdown	immediately	Type A, 1 Trip
		This monitoring checks if there is no write failure during the system shutdown phase. A fault is set if values can not be written in the EEPROM during postrun	write failure occured	= True	Software State	= Shutdown	0.02 [Sec]	Type A, 1 Trip
		This monitoring checksthe CAN initialization function has taken too long to finish . The access to message Ram by the CAN-Core is handle through a message interface register. In each cycle a CAN register bit is checked to determine if the bit is set. A fault is set if the loop lasts longer than a threshold	Number of CAN cycles	> 1000	Software State	= Running	0.02 [Sec]	Type A, 1 Trip
		This monitoring checksthe CAN initialization function has taken too long to finish . The access to message Ram by the CAN-Core is handle through a message interface register. In each cycle a CAN register bit is checked to determine if the bit is set. A fault is set if the loop lasts longer than a threshold	Number of CAN cycles	> 1000	Software State	= Running	0.02 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Control Module Long Term Memory Reset	P0603	This monitoring cheks for a plausible EEPROM cell defect. A fault is set if the regenerative braking counter value can not be read from the EEPROM	Regenrative braking counter value can not be read	= True	Software State	= Init	Immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring checks for a plausible EEPROM cell defect. A fault is set if the delta dead volume of the Pression-Volume (pV) characteristics can not be read from the EEPROM	Delta dead volume of the pV characteristics can not be read	= True	Software State	= Init	Immediately	Type A, 1 Trip
		This monitoring cheks for a plausible EEPROM cell defect. A fault is set if the Pressure-Volume characteristics correction factor can not be read from the EEPROM.	Pressure-Volume characteristics correction factor can not be read	= True	Software State	= Init	Immediately	Type A, 1 Trip
		This monitoring strategy checks the stored value of Elektric Motor idle position. The rotor idle position is written to an EEPROM cell at the end of the production line. This EEPROM cell is read at Ignition State. A fault will be set if the stored value of the “Motor_IdlePositionTravel” could not be read from EEPROM cell.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if there is no calibration of electric motor idle position. The rotor idle position is written to a EEPROM cell of an EEPROM at end of production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the stored Electric Motor angle at the lower end stop position can be read. The brake booster electric motor angle at the lower end stop position is measured and written to an EEPROM cell at the end of the production line. This EEPROM cell is read at Ignition State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This Monitoring checks that one value of the eBoost basic Init conditions is available. The brake booster motor angle at backwards bound is measured and written to an EEPROM cell at end of production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if there is a reading problem of the EEPROM. The plunger release position is written to an EEPROM cell of an EEPROM at the end of the production line. This EEPROM cell is read at Ignition State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if data in EEPROM is empty. The plunger release position is written to a EEPROM cell the end of production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the customer identifier is correct. At Init, the persistent data manager checks the mismatch of the EEPROM cell value and expected customer ID. A fault is set if the expected customer ID does not match with the stored customer ID.	Stored customer ID	≠ expected customer ID	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the system do not find the enhanced platform software end marker which is use to help the system to find the end of data. At ignition state the Persistent Data Manager checks the content of the EEPROM. A fault is set if the enhanced platform software end marker has not been found.	No enhanced platform software end marker in EEPROM	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks the stored data field size is correct. At Ignition State, the Persistent Data Manager checks the content of the EEPROM. A fault is set if a data field size in EEPROM does not match data item configuration in software.	Data field size in the EEPROM	≠ data size configuration in software	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks the reading accessibility of the EEPROM. At Init, the Persistent Data Manager checks the content of the EEPROM. A fault is set if an access error occurs while reading the EEPROM.	Read error occurs OR Not expected Non-Markable Interrupt detected	= True = True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if a stored BPTS value can be read. The BPTS detects the position of the brake pedal. Before providing proper values, the BPTS has to be calibrated using calibration values stored in an EEPROM cell. This EEPROM cell is read during the eBoost initialization state. A fault is set if a read failure occurs.	read failure occured	= True	Software State	= Init	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the EEPROM cell which contains the calibrations value of the Brake Pedal Travel Sensor (BPTS) is empty. The BPTS provides two separate signals with different transmissions and signal conditionings. Each signal is calibrated at end of production line, and calibration values are written to a cell of an EEPROM. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the calibrated position value can be read. The Brake Pedal Travel Sensor (BPTS) detects the position of the brake pedal. Before providing proper values, it has to be calibrated by using calibration values stored in an EEPROM cell. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the calibrated offset value can be read. The Brake Pedal Travel Sensor (BPTS) detects the position of the brake pedal. Before providing proper values, it has to be calibrated by using calibration values stored in an EEPROM cell. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the EEPROM cell which contains the calibrated offset value is empty. The Brake Pedal Travel Sensor (BPTS) detects the position of the brake pedal. Before providing proper values, it has to be calibrated by using calibration values stored in a EEPROM cell in an EEPROM memory. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the calibrated value can be read. The Brake Pedal Travel Sensor (BPTS) detects the position of the brake pedal. Before providing proper values, it has to be calibrated by using calibration values stored in an EEPROM cell in an EEPROM memory. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the calibrated offset value can be read. The Brake Pedal Travel Sensor (BPTS) detects the position of the brake pedal. Before providing proper values, it has to be calibrated by using calibration values stored in an EPPROM cell. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the EEPROM cell which contains the calibrations value is empty. The Brake Pedal Travel Sensor (BPTS) detects the position of the brake pedal. Before providing proper values, it has to be calibrated by using calibration values stored in an EEPROM cell. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks the compensation of the 1, 2, 6 or 8 order of RPS signal. A fault is set If the compensation of 1, 2, 6 or 8 order of RPS signal is not working due to a lack of informations of the EEPROM.	Lack of information of the EEPROM for RPS	= True	Software State	= Init	0.005 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if a stored value of RPS x-value offset could be read. The correction value for the X raw signal of the Rotor Position Sensor (RPS) is written to an EEPROM cell at end of production line. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the EEPROM cell which contains the offset of the X-value of RPS is empty.The correction value for the X raw signal of the Rotor Position Sensor (RPS) is written to an EEPROM cell at the end of the production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if a stored value of RPS y value offset could be read. The correction value for the Y raw signal of the Rotor Position Sensor (RPS) is written to an EEPROM cell at end of production line. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the EEPROM cell which contains the offset of the Y-value of RPS is empty. The correction value for the Y raw signal of the Rotor Position Sensor (RPS) is written to an EEPROM cell at the end of the production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if a stored value of RPS synchronicity could be read. The amplitude synchronicity of the X and Y raw values of the Rotor Position Sensor (RPS) is written to an EEPROM cell at end of production line. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the EEPROM cell which contains the offset of the X-value of RPS is empty. The amplitude synchronicity of the X and Y raw values of the Rotor Position Sensor (RPS) are written to an EEPROM cell at the end of the production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the Rotor Position Sensor (RPS) offset can be read. The RPS offset is written to an EEPROM cell at end of production line. This EEPROM cell is read at Init State. A fault is set if a read failure occurs.	Read failure occurs	= True	Software State	= Init	immediately	Type A, 1 Trip
		This monitoring strategy checks if the EEPROM cell which contains the offset of the RPS is empty. The rotor idle position is written to an EEPROM cell at the end of the production line. This EEPROM cell is read at Ignition State. A fault is set if the EEPROM cell is empty.	Register is empty	= True	Software State	= Init	immediately	Type A, 1 Trip
		DTC PASS	Turn ignition off and wait at least 90 sec, turn ignition on and wait 5sec					

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 monitoring strategy checks the values of a specific RAM area. Furthermore, the address decoder is tested using test patterns to ensure bus integrity. The test writes different patterns at the addresses of this RAM area. Addresses are then read out and a signature for all the readout values is calculated. The original content in RAM is afterwards rewritten. The order of the patterns is chosen so that the signature the multibit and coupling failures can be set during the signature evaluation. A fault is set if a multibit or coupling failure is detected.	Multi-bits failure detected OR Coupling failure detected OR Address decoder test detects an error	= True = True = True	System voltage	> 6.9 V	Immediately	Type A, 1 Trip
		This monitoring strategy checks correct functionality of Random Access Memory (RAM). A programmable Built In Self Test runs in start-up phase. It is a test implemented in hardware, triggered and evaluated in software. A fault is set if the memory test detects a failure.	Memory test detects a fault	= True	Software State	= Init	Immediately	Type A, 1 Trip
		This monitoring strategy checks if there is a single bit error at RAM. Because of Error Correction Code, RAM single-bit errors are always corrected. A fault will be set if the numberof bit errors exceeds a threshold.	Number of detected single-bit errors	> 2	Software State	= Running OR Shutdown	immediately	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Control Module Read Only Memory (ROM)	P0601	This monitoring strategy checks the correct CRC of Flash EEPROM. Initially and cyclically the complete Flash EEPROM contents is checked by calculating a CRC value and comparing it with the checksum generated during the software build process. A fault is set if a double bit error of Flash EEPROM is detected, or if more than a number of single bit errors are detected (otherwise single bit errors are corrected).	Double bit error detected OR Number of detected single bit errors	= True > 1	Software State	= Init OR Running OR Shutdown	immediately During Startup or respectively after 60 sec for cyclic flash checksum test.	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Extended Brake Pedal Travel	C0075	This monitoring strategy checks if the differential stroke is in range. Due to a mechanical coupling of the boost body and the pedal travel sensor, the differential stroke can only have defined range. A fault is set if the differential stroke exceeds the range.	brake pedal stroke - boost body stroke	< - 5.0 mm	Software State	= Running OR Shutdown	0.04 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Ignition Switch - Accessory Position - Circuit Low	P2537	Detects an accessory position circuit open	Accessory .	= False	Propulsion System Active Propulsion System Active Time	= True > 0.5 Sec	0.5 [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 - Circuit High	P2535	Detects if the Run/Crank input circuit is high	Short to Battery	> 5 V	CAN Communication And ECM Run/Crank Active Data	= Enabled = False	2.5 [sec]	Type A, 1 Trip
Ignition Switch - Circuit Low	P2534	Detects if the Run/Crank input circuit is low	Short to Ground Or Open Condition	< 2 V = True	CAN Communication And ECM Run/Crank Active Data	= Enabled = Active	2.5 [sec]	Type A, 1 Trip
Internal Control Module A/D Processing Performance	P060B	This monitoring strategy checks the conversion time of the ADC (Analog Digital Converter). The ADC periodically reads an analog signal and converts it into digital values. Before starting a new conversion, the monitor checks that the previous conversion is finished. A fault is set if the previous conversion is not finished for a number of checks.	number of conversions which could not be finished in time	> 9	Software State	= Running	0.003 [sec]	Type A, 1 Trip
		This monitoring strategy checks proper functionality of ADC self-test. To do this, ADC channels are switched to two predefined internal microcontroller resistors to measure defined (voltage) levels (high and low).The absolute differences between the two measurements are calculated in unit digits. A fault will be set if the difference is greater than a threshold.	Absolute(difference between the two ADC measurements)	> 540 digits	Software State	= Running	0.2 [sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Lost Communication with Brake System Control Module on Bus E	U1833	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x21B not received on Bus E	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x21E not received on Bus E	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip

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"	U0100	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0xC9 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.25 [sec]	Type B, 2 Trips
		This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x4C1 not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	1.25 [sec]	Type B, 2 Trips
Lost Communication With Hybrid Powertrain Control Module	U0293	This monitoring strategy checks if no messages are sent. The network driver has to send and receive all network messages. At the same time it has to check that the messages are correct (length, checksum, alive-counter, reception timeout). The diagnostic performs a Time out check. A fault is set if no message is received within a defined amount of time.	0x1DF not received on Bus A	= True	System voltage AND System voltage AND Bus Off Fault Active ECU is sending/receiving on CAN AND ECU Power Mode transition diagnostic enable delay timer	> 7.5 V < 16 V = False = True ≥ 5 Sec	0.1 [Sec]	Type A, 1 Trip
Sensor Reference Voltage "A" Circuit Range/Performance	P06A6	This monitoring strategy checks if the BPTS supply voltage is in range. The Brake Booster Electronic Control Unit (ECU) evaluates the supply voltage of the brake pedal position sensors. A fault is set if the supply voltage is outside of a certain range.	BPTS supply voltage OR BPTS supply voltage	< 4.68 V > 5.32 V	Software State	= Init OR Running OR Shutdown	0.06 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
Sensor Reference Voltage "B" Circuit Range/Performance	P06A7	This monitoring strategy checks if the RPS1 supply voltage is in range. Periodically the RPS1 IC transmits a safety word together with raw values. The voltage-flag of the RPS1 safety word indicates either one of the following errors (failure modes cannot be distinguished): • Under voltage error • Over voltage error • Open circuit A fault is set if the voltage-flag of the RPS1 safety word is set.	voltage-flag of RPS1 safety word set	= True	Software State	= Running OR Shutdown	0.02 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Sensor Reference Voltage A Circuit Low	P0642	This monitoring strategy checks if the BPTS supply under voltage. A fault is set if BPTS under voltage is caused by Voltage Sensor3 under voltage.	BPTS supply voltage AND Voltage Sensor3	< 4.68 V < 5.6 V	Software State	= Running OR Shutdown	0.06 [Sec]	Type A, 1 Trip
		DTC PASS	Turn ignition on and wait for at least 5sec					
System Configuration Error	C1449	This monitoring strategy checks if the calibrated idle position can be reached at the end of BPTS calibration routine at end of production line.	Idle position not reached	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if all written BPTS calibration values can be read at the end of production line.	read failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the BPTS calibration routine has been completed at the end of production line	Calibration routine aborted	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring checks if the pre drive check is missed at the end of the production line	Pre drive check missed	= True	Sofware State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if measured value for idle position at OES calibration routine can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if measured electric motor angle value at OES calibration routine can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the measured value of punger release position at OES calibration routine can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the BPTS hysteresis value can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the BPTS1 offset based on mounting position can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
		This monitoring strategy checks if the BPTS2 offset based on mounting position can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the calibration value of BPTS1 has been written at the enod of production line.	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the calibration value of BPTS2 has been written at the enod of production line.	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the RPS1 X value offset can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the offset Y value of RPS1 can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip
		This monitoring strategy checks if the synchonicity value of RPS1 can be written. A fault is set if the value can not be written in the EEPROM at the end of the production line	write failure occured	= True	Software State	= Diag	immediately	Type A, 1 Trip