Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Blower Motor Speed Return Circuit High	B2B02	This DTC will detect when the blower motor feedback hardwire circuit signal is too out of range high. This includes some non-OBD failures in the blower system, open, and short to 12 V. Blower Motor Speed Return Circuit High Diagnostic will consume the Climate Control Front Blower Fan Speed Feedback Wire Duty Cycle High Fault Status from the OBD Smart Device "BCM" and increment the failure counter when a fail occurs. X of Y will determine fault maturation and when to set the DTC. The Emisssion Neutral State for this failure is to set the sensed Blower Motor Speed value to zero	Duty Cycle	>= 90% and <= 100%	No active DTC's:	High Speed CAN enabled U0140 Loss of Comm BCM FA Not Set B2B38 Message Counter Incorrect FA not Set Blower Command > 5% Duty Cycle	8 failures out of 10 samples 1 sample per second	Type C, No SVS "Emissions Neutral Diagnostics – Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Blower Motor Speed Return Circuit Low	B2B03	This DTC will detect when the blower motor feedback hardwire circuit signal is out of range low. This includes some internal blower failures and short to ground conditions. Blower Motor Speed Return Circuit Low Diagnostic will consume the Climate Control Front Blower Fan Speed Feedback Wire Duty Cycle Low Fault Status from OBD Smart Device "BCM" and increment the failure counter when a fail occurs. X of Y will determine fault maturation and when to set the DTC. The Emisssion Neutral State for this failure is to set the sensed Blower Motor Speed value to zero	Duty Cycle	>= 0% and <= 10%	No active DTC's:	High Speed CAN enabled U0140 Loss of Comm BCM FA Not Set B2B38 Message Counter Incorrect FA not Set Blower Command > 5% Duty Cycle	8 failures out of 10 samples 1 sample per second	Type C, No SVS "Emissions Neutral Diagnostics – Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Blower Motor Speed Return Feedback Circuit Out of Range High	B2B0B	This DTC will detect when the blower motor feedback sensor is reporting a value above the maximum allowed. Blower Motor Speed Feedback Circuit Out of Range High Diagnostic will consume the Climate Control Front Blower Fan Speed Feedback Frequency from the OBD Smart Device "BCM" and increment the failure counter when a fail occurs. X of Y will determine fault maturation and when to set the DTC. The Emisssion Neutral State for this failure is to set the sensed Blower Motor Speed value to zero	DC frequency	> 200 Hertz	No active DTC's:	High Speed CAN enabled U0140 Loss of Comm BCM FA Not Set B2B38 Message Counter Incorrect FA not Set B2B02 FA Not Set B2B03 FA Not Set	8 failures out of 10 samples 1 Sec / Sample	Type C, No SVS "Emissions Neutral Diagnostics – Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Blower Motor Speed Return Feedback Circuit Out of Range Low	B2B0C	This DTC will detect when the blower motor feedback sensor is reporting a value less then the minimum allowed. Blower Motor Speed Feedback Circuit Out of Range Low Diagnostic will consume the Climate Control Front Blower Fan Speed Feedback Frequency from the OBD Smart Device "BCM" and increment the failure counter when a fail occurs. X of Y will determine fault maturation and when to set the DTC. The Emisssion Neutral State for this failure is to set the sensed Blower Motor Speed value to zero	DC frequency	< 45 Hertz	No active DTC's:	High Speed CAN enabled U0140 Loss of Comm BCM FA Not Set B2B38 Message Counter Incorrect FA not Set B2B02 FA Not Set B2B03 FA Not Set	8 failures out of 10 samples 1 Sec / Sample	Type C, No SVS "Emissions Neutral Diagnostics – Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
CGM Ignition Switch Run/ Start Position Circuit Low	B2B0D	This DTC monitors for a CGM Ignition Switch Run/Start Position Circuit Low error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Ignition Switch Run/Start Position Circuit Low DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
CGM Ignition Switch Run/ Start Position Circuit High	B2B0E	This DTC monitors for a CGM Ignition Switch Run/Start Position Circuit High error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Ignition Switch Run/Start Position Circuit High DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
CGM Control Module Memory Failure	B2B12	This DTC monitors for a CGM Control Module Memory Failure error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Control Module Memory Failure DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
CGM Control Module Internal Performance Failure	B2B13	This DTC monitors for a CGM Control Module Internal Performance Failure error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Control Module Internal Performance Failure DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
Blower Motor Return Circuit Signal Check Fault	B2B38	This DTC monitors for an error in communication with the Blower Motor Speed Return signals. The Emisssion Neutral State for this failure is to set the sensed Blower Motor Speed value to zero.	Communication of the Alive Rolling Count from the BCM over CAN bus is incorrect for out of total samples	 >= 8 counts 10 counts	No active DTC's:	High Speed CAN enabled U0140 Loss of Comm BCM FA Not Set	1 Sec / counts	Type C, No SVS "Emissions Neutral Diagnostics – Type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Steering Wheel Angle Sensor Signal Message Counter Incorrect	C1211	This DTC monitors for an error in the Steering Wheel Angle Sensor Signal Message Counter. Emission neutral default state is disable steering angle based auto-stop inhibit and perform auto-stops.	Communication of the Alive Rolling Count or Protection Value from the Steering Wheel Angle Sensor over CAN bus is incorrect for out of total samples	 >= 14.00 counts >= 15.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type C, No SVS "Safety Emissions Neutral Diagnostic"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lateral Acceleration Sensor Circuit Low	C124F	Controller specific analog circuit diagnoses the raw lateral acceleration signal for a short to ground or open fault by comparing raw signal value to fail thresholds. Emission neutral default state sets lateral acceleration signal = 0.0 g.	raw lateral acceleration signal when sensor type is directly proportional OR raw lateral acceleration signal when sensor type is inversely proportional update raw lateral acceleration signal stability time, fail and sample time, 50 millisecond update rate	≤ -3.8500 g ≥ -3.8500 g (≤ 0.5 Ω impedance between signal and controller ground)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw lateral acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lateral Acceleration Sensor Circuit High	C1250	Controller specific analog circuit diagnoses the raw lateral acceleration signal for a short to power or open fault by comparing raw signal value to fail thresholds. Emission neutral default state sets lateral acceleration signal = 0.0 g.	raw lateral acceleration signal when sensor type is directly proportional OR raw lateral acceleration signal when sensor type is inversely proportional update raw lateral acceleration signal stability time, fail and sample time, 50 millisecond update rate	≥ 3.8500 g ≤ 3.8500 g (≤ 0.5 Ω impedance between signal and controller power)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw lateral acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lateral Acceleration Sensor Performance	C1251	Controller specific analog circuit diagnoses the raw lateral acceleration signal for a signal value that is stuck in a valid range by comparing raw signal value to fail thresholds. Emission neutral default state sets lateral acceleration signal = 0.0 g.	ABS(raw lateral acceleration signal) AND ABS(raw lateral acceleration signal) update raw lateral acceleration signal fail, 50 millisecond update rate	≥ 0.5300 g ≤ 3.8500 g	battery voltage run crank voltage diagnostic monitor enable update raw lateral acceleration signal stablity time: TOSS vehicle speed automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear ABS(raw lateral acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean ≥ 15.0 KPH = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA	raw lateral acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Longitudinal Acceleration Sensor Circuit Low	C1252	Controller specific analog circuit diagnoses the raw longitudinal acceleration signal for a short to ground or open fault by comparing raw signal value to fail thresholds. Emission neutral default state sets lateral longitudinal acceleration signal = 0.0 g.	raw longitudinal acceleration signal when sensor type is directly proportional OR raw longitudinal acceleration signal when sensor type is inversely proportional update raw longitudinal acceleration signal stability time, fail and sample time, 50 millisecond update rate	≤ -3.8500 g ≥ -3.8500 g (≤ 0.5 Ω impedance between signal and controller ground)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw longitudinal acceleration signal stability time ≥ 15.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Longitudinal Acceleration Sensor Circuit High	C1253	Controller specific analog circuit diagnoses the raw longitudinal acceleration signal for a short to power or open fault by comparing raw signal value to fail thresholds. Emission neutral default state sets lateral longitudinal acceleration signal = 0.0 g.	raw longitudinal acceleration signal when sensor type is directly proportional OR raw longitudinal acceleration signal when sensor type is inversely proportional update raw longitudinal acceleration signal stability time, fail and sample time, 50 millisecond update rate	≥ 3.8500 g ≤ 3.8500 g (≤ 0.5 Ω impedance between signal and controller power)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw longitudinal acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Longitudinal Acceleration Sensor Performance	C1254	Controller specific analog circuit diagnoses the raw longitudinal acceleration signal rationalized against the TOSS vehicle speed acceleration. The diagnostic monitor can be designed to detect an invalid longitudinal acceleration signal based on the TOSS vehicle speed windows and TOSS vehicle speed acceleration, 4 windows can be enabled. The delta between the TOSS vehicle speed acceleration and longitudinal acceleration signal is taken within each window to verify the delta is small, no failure indicated, or the delta is large indicating the longitudinal acceleration signal is in error. Emission neutral default state sets lateral longitudinal acceleration signal = 0.0 g.	ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 1 fail time, 50 millisecond update rate	≥ 0.5300 g	battery voltage run crank voltage diagnostic monitor enable region 1 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal acceleration signal) update region 1 sample time: brake pedal position engine torque TOSS vehicle speed acceleration TOSS vehicle speed TOSS vehicle speed	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≥ 0.5300 g ≤ 3.8500 g ≤ 0.70 % ≥ 80.0 Nm ≥ 0.1500 g ≥ 15.0 KPH ≤ 200.0 KPH	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate region 1 fail time ≥ 75.0 seconds out of region 1 sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	< 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError		
			ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 2 fail time, 50 millisecond update rate	≥ 0.0000 g	battery voltage run crank voltage diagnostic monitor enable region 2 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal acceleration signal)	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≥ 0.5300 g ≤ 3.8500 g	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					update region 2 sample time: brake pedal position engine torque TOSS vehicle speed acceleration TOSS vehicle speed TOSS vehicle speed ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	 ≤ 0.70 % ≥ 80.0 Nm ≥ 0.1500 g ≥ 0.0 KPH ≤ 0.0 KPH < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError	region 2 fail time ≥ 75.0 seconds out of region 2 sample time ≥ 120.0 seconds, 50 millisecond update rate	
			ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 3 fail time, 50 millisecond update rate	≥ 0.0000 g	battery voltage run crank voltage diagnostic monitor enable region 3 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P07C0 fault active P07C0test fail this key on attained gear ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal acceleration signal) update region 3 sample time: brake pedal position engine torque ABS(TOSS vehicle speed acceleration) TOSS vehicle speed ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	= FALSE = FALSE = 1st thru 10th ≥ 0.5300 g ≤ 3.8500 g ≤ 0.70 % ≥ 80.0 Nm ≤ 0.1000 g ≥ 0.0 KPH < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError	region 3 fail time ≥ 75.0 seconds out of region 3 sample time ≥ 120.0 seconds, 50 millisecond update rate	
			ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 4 fail time, 50 millisecond update rate	≥ 0.0000 g	battery voltage run crank voltage diagnostic monitor enable region 3 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					diagnsotic fault sequence gear active	= FALSE		
					P0716 fault active	= FALSE		
					P0716 test fail this key on	= FALSE		
					P0717 fault active	= FALSE		
					P0717 test fail this key on	= FALSE		
					P07BF fault active	= FALSE		
					P07BF test fail this key on	= FALSE		
					P07C0 fault active	= FALSE		
					P07C0test fail this key on	= FALSE		
					attained gear	= 1st thru 10th		
					ABS(raw longitudinal acceleration signal)	≥ 0.5300 g		
					AND			
					ABS(raw longitudinal acceleration signal)	≤ 3.8500 g		
					update region 4 sample time:		region 4 fail time ≥ 75.0 seconds out of region 4 sample time ≥ 120.0 seconds, 50 millisecond update rate	
					brake pedal position	≤ 0.70 %		
					engine torque	≤ 80.0 Nm		
					TOSS vehicle speed acceleration	≤ 0.1500 g		
					TOSS vehicle speed	≥ 0.0 KPH		
					TOSS vehicle speed	≤ 0.0 KPH		
					ABS(raw longitudinal acceleration signal) update sample time	< 0.5300 g		
					U0073 fault active	= FALSE		
					U0073 test fail this key on	= FALSE		
					DTCs not fault active	VehicleSpeedSensor_FA VehicleSpeedSensorError		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft System Performance – Bank 1	P0011	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive.	(Intake cam Bank 1) Cam Position Error > (**P0011_CamPosErrorLimIc1**) deg	**Intake Cam Phsr Enable**	= TRUE	135.00 failures out of 150.00 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> (**P0011_CamPosErrorLimIc1**) deg AND < (**CalculatedPerfMaxIc1**) deg		
					Desired cam position variation	< 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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft System Performance – Bank 1	P0014	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive.	(Exhaust cam Bank 1) Cam Position Error > (**P0014_CamPosErrorLimEc1**) deg	**Exhaust Cam Phsr Enable**	= TRUE	135.00 failures out of 150.00 samples 100 ms /sample	Type A, 1 Trips
					System Voltage	> 11.00 Volts		
					Engine Running	= TRUE		
					Power Take Off (PTO) active	= FALSE		
					Desired cam position	> 0 deg		
					Desired AND Measured cam position	> (**P0014_CamPosErrorLimEc1**) deg AND < (**CalculatedPerfMaxEc1**) deg		
					Desired cam position variation	< 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.	-9.1 Crank Degrees 11.7 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 Delay diagnostic if Engine RPM and Cam is Enabled for	CrankSensor_FA P0340, P0341 < 1.0 seconds > 8,200.00 < 3.00	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position (CKP)- Camshaft Position (CMP) Correlation Bank 1 Sensor 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..	-8.1 Crank Degrees 12.8 Crank Degrees	Crankshaft and camshaft position signals are synchronized Engine is Spinning Cam phaser is in "parked" position No Active DTCs: Time since last execution of diagnostic Delay diagnostic if Engine RPM and Cam is Enabled for	 CrankSensor_FA P0365, P0366 < 1.0 seconds > 8,200.00 < 3.00	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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 1 Control Circuit Open	P001A	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 1 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 1 Control Circuit Low Voltage	P001B	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 1 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 1 Control Circuit High Voltage	P001C	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 1 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 1 Circuit Open	P002A	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 1 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 1 Circuit Low Voltage	P002B	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 1 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 1 Circuit High Voltage	P002C	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 1 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	4.00 fails out of 5.00 samples	Type A, 1 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 output 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 output 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 output 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.
Turbo/Super Charger Bypass Valve A Control Circuit	P0033	Controller specific output driver circuit diagnostic, diagnosing the 'compressor recirculation valve 'A' actuator' low sided driver for an open circuit failure, when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedance between output and controller ground	Diagnostic enabled ****************************** Powertrain relay voltage ****************************** Engine does not crank Diagnostic system not disabled	True ****************************** >= 11.0 Volts ******************************	10 failures out of 12 samples PWM CRV: 100ms / sample eCRV: 12.5ms / sample	Type A, 1 Trips Note: In certain controllers P0034 may also set turbo/ super charger bypass valve control circuit low

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve A Control Circuit Low	P0034	Controller specific output driver circuit diagnostic, diagnosing the 'compressor recirculation valve 'A' actuator' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controllers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedance between output and controller ground	Diagnostic Enabled ***************************** Powertrain relay voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts *****************************	10 failures out of 12 samples PWM CRV: 100ms / sample eCRV: 12.5ms / sample	Type A, 1 Trips Note: In certain controllers P0033 may also set turbo/ super charger bypass balve control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve A Control Circuit High	P0035	Controller specific output driver circuit diagnostic, diagnosing the 'compressor recirculation valve 'A' actuator' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds. In series application, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controllers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedance between output and controller power.	Diagnostic enabled ***************************** Powertrain relay voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts *****************************	10 failures out of 12 samples PWM CRV: 100ms / sample eCRV: 12.5ms / sample	Type A, 1 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 output 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 output 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 output 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.
Intake Camshaft Profile Actuator 1 Performance	P003C	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 1	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 1 Pin Stuck	P003D	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 1 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 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	3.7 < ohms < 8.8	No Active DTC's Coolant – IAT Engine Soak Time Coolant Temp Ignition Voltage Engine Run time	ECT_Sensor_FA P262B IAT_SensorFA < 8.0 ºC > 28,800 seconds ≥ -30.0 ºC < 32.0 volts < 0.15 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.
Exhaust Camshaft Profile Actuator 1 Performance	P005A	An Uninteded pin firing wlithout controller command. Exhaust Camshaft Profile Actuator 1	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

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

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 internal combustion	**<u>Engine Off:</u>** If IAT >= OAT: IAT - OAT If IAT < OAT: OAT - IAT If either of the following conditions are met, this diagnostic will pass: If IAT >= OAT: IAT - OAT If IAT < OAT: OAT - IAT	> 15.0 deg C > 15.0 deg C <= 15.0 deg C <= 15.0 deg C	Time between current ignition cycle and the last time the engine was running Engine is not running Vehicle Speed Coolant Temperature - IAT IAT - Coolant Temperature OAT-to-IAT engine off equilibrium counter The "OAT-to-IAT engine off equilibrium counter" is a counter that is incremented or decremented based on vehicle speed when the engine is off. When this counter is high enough, the vehicle has reached an equilibrium where IAT and OAT can be compared. The value that is added or subtracted to the counter every 100 msec is contained in table **P0071: OAT Performance Drive Equilibrium Engine Off** No Active DTCs:	>= 28,800.0 seconds >= 15.5 MPH < 15.0 deg C < 15.0 deg C >= 300.0 counts VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_Ckt_FA MAF_SensorFA EngineModeNotRunTimer Error	Executed every 100 msec until a pass or fail decision is made	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		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.	**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	Time between current ignition cycle and the last time the engine was running 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:	>= 28,800.0 seconds >= 15.5 MPH >= 10.0 grams/second >= 300.0 counts VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_Ckt_FA 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 was enabled, but 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	<= 46 Ohms (~150 deg C)	None		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	>= 427,757 Ohms (~-60 deg C)	None		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	None		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 OR High Pressure Fuel Pump Delivery Angle	>= 92 ° <= 0 °	High Pressure Pump Performance Diagnostic Enable Battery Voltage Low Side Fuel Pressure 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 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	True >= 11 Volts > 0.275 MPa Enabled when a code clear is not active or not exiting device control Engine is not cranking >= 70.0 KPA >= -12.0 degC -12 <= Temp degC <= 126	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.
					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	**<u>Good Correlation Between IAT and IAT3:</u>** ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT - Power Up IAT3) AND ABS(Power Up IAT2 - Power Up IAT3)	> 30 deg C <= 25 deg C > 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time If application has LIN MAF: LIN Communications established with MAF No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimer Error	Executes once at the beginning of each ignition cycle if enable conditions are met	Type B, 2 Trips
			<u>Not Good Correlation, IAT in middle:</u> Power Up IAT is between Power Up IAT2 and Power Up IAT3 AND ABS(Power Up IAT2 - Power Up IAT3) AND ABS(Power Up IAT - Power Up IAT2) > ABS(Power Up IAT - Power Up IAT3)	> 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time If application has a LIN MAF: LIN Communications established with MAF 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	

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.	**Not Good Correlation, IAT3 in middle:** Power Up IAT3 is between Power Up IAT and Power Up IAT2 AND ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT3 - Power Up IAT2) > ABS(Power Up IAT3 - Power Up IAT)	> 30 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time If application has a LIN MAF: LIN Communications established with MAF 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	

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 LIN MAF)	P0097	Detects an erroneously low value being reported over the LIN serial connection from the Intake Air Temperature 2 (IAT2) sensor. The diagnostic monitors the IAT2 sensor output temperature and fails the diagnostic when the IAT2 temperature 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 transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	IAT 2 Temperature	< -60 degrees C	Powertrain Relay Voltage for a time LIN Communications established with MAF 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 LIN MAF)	P0098	Detects an erroneously high value being reported over the LIN serial connection from the Intake Air Temperature 2 (IAT2) sensor. The diagnostic monitors the IAT2 sensor output temperature and fails the diagnostic when the IAT2 temperature 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 transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	IAT 2 Temperature	> 150 degrees C	Powertrain Relay Voltage for a time LIN Communications established with MAF 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.	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 If application has a LIN MAF: LIN Communications established with MAF 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	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.	ECT Resistance (@ -60ºC) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	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 Temperature Sensor Circuit Intermittent/ Erratic	P00B5	Circuit Erratic This DTC detects large step changes in the RCT (Radiator Coolant temperature) signal circuit or the RCT 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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4		No Active DTC's	EECR_RCT_Erratic_TFTKO EECR_RCT_CktHiLo_FA	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. ******************************	 2.5 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Pressure Start Diagnostic	P00C6	The DTC Diagnoses the high side fuel pressure during engine cranking.	The ECM detects that the fuel pressure is not rising or has fallen beyond acceptable limits during engine cranking Pressure Rise Test: Sensed High Pressure Fuel Rail Pressure value Pressure Fall Test: Sensed High Pressure Fuel Rail Pressure value	< **P00C6 - Minimum pressure in MPa that will exit High Pressure Start mode and allow fuel delivery** (see Supporting Table) <= **P00C6 - Minimum acceptable value of fuel rail pressure after High Pressure Start** (see Supporting Table)	High Pressure Rise Diagnostic During Start High Pressure Fail Diagnostic During Start Low side feed fuel pressure Engine Run Time Run/Crank Voltage Engine Coolant For each engine start, only 1 diagnostic is performed. The pressure rise test will run if HIgh side fuel pressure is less than KtFHPC_p_HighPressStart, otherwise, the pressure fall diagnostic will run The pressure fall runs when the engine is cranking.	True False >= 0 KPA < = 0 sec > 8 Volts -100 <= °C <= 126 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	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.
					Barometric Pressure Inlet Air Temp	commanded pressure is 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 >= 70.0 KPA >= -12.0 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 (single turbo)	P00C7	Detects an inconsistency between pressure sensors in the induction system in which a particular sensor cannot be identified as the failed sensor. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Manifold Pressure (MAP), Turbocharger Boost Pressure and Barometric Pressure (BARO) sensors values are checked to see if they are within the normal expected atmospheric pressure range. If they are, then MAP, Turbocharger Boost Pressure and BARO are compared to see if their values are similar. If two of these three sensors are similar, but the third is not, then a performance diagnostic for the specific sensor with the dissimilar value will fail. If there is no combination of two of	ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure) OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold	> 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa <= 10.0 kPa <= 10.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating Manifold Pressure Manifold Pressure Baro Pressure Baro Pressure Turbocharger Boost Pressure Turbocharger Boost Pressure If application has a LIN MAF: LIN Communications established with MAF No Active DTCs: No Pending DTCs:	> 10.0 seconds >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa >= 50.0 kPa <= 115.0 kPa EngineModeNotRunTimer Error MAP_SensorFA AAP_SnsrFA AAP2_SnsrFA AAP_LIN1_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP_LIN1_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec for applications without LIN MAF 1 sample every 25 msec for applications with LIN MAF	Type B, 2 Trips

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

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

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.	**Not Good Correlation, IAT2 in Middle:** 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 IAT3) > ABS(Power Up IAT2 - Power Up IAT)	> 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time If application has a LIN MAF: LIN Communications established with MAF No Active DTCs:	> 28,800 seconds >= 11.0 Volts >= 0.9 seconds PowertrainRelayFault ECT_Sensor_Ckt_FA IAT_SensorCircuitFA MnfdTempSensorCktFA HumTempSnsrCktFA EngineModeNotRunTimerError	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.
Intake Air Temperature Sensor Circuit 3 Low (applications with manifold temperature and humidity)	P00EA	Detects a continuous short to ground in the Intake Air Temperature 3 (IAT3) signal circuit by monitoring the IAT3 sensor output resistance and failing the diagnostic when the IAT3 resistance is too low. The IAT3 sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A lower resistance is equivalent to a higher temperature.	Raw IAT 3 Input	< 57.94 Ohms (~150 deg C)	None		40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor Circuit 3 High (applications with manifold temperature and humidity)	P00EB	Detects a continuous open circuit in the Intake Air Temperature 3 (IAT3) signal circuit by monitoring the IAT3 sensor output resistance and failing the diagnostic when the IAT3 resistance is too high. The IAT3 sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. A higher resistance is equivalent to a lower temperature.	Raw IAT 3 Input	> 153,665 Ohms (~-60 deg C)	None		40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Air Temperature Sensor 3 Intermittent In-Range	P00EC	Detects a noisy or erratic signal in the Intake Air Temperature 3 (IAT3) circuit by monitoring the IAT3 sensor and failing the diagnostic when the IAT3 signal has a noisier output than is expected. When the value of the IAT3 signal in °C is determined, a delta is calculated between the current reading and the previous reading. The absolute value of these deltas is summed over a number of IAT3 readings. The result of this summation is called a “string length”. Since the IAT3 signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic IAT3 signal. The diagnostic will fail if the string length is too high.	String Length Where: "String Length" = sum of "Diff" calculated over And where: "Diff" = ABS(current IAT 3 reading - IAT 3 reading from 100 milliseconds previous)	> 80.00 deg C 10 consecutive IAT 3 readings	None		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.
Humidity Sensor Circuit Low (applications with LIN MAF)	P00F4	Detects an eroneously low value being reported over the LIN serial connection from the humidity sensor. The diagnostic monitors the humidity sensor relative humidity output and fails the diagnostic when the humidity percentage is too low. The humidity sensor converts the capacitance across the sensor to a relative humidity. The relative humidity percentage value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	Relative Humidity	<= -6.25 %	Powertrain Relay Voltage for a time LIN Communications established with MAF 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 (applications with LIN MAF)	P00F5	Detects an eroneously high value being reported over the LIN serial connection from the humidity sensor. The diagnostic monitors the humidity sensor relative humidity output and fails the diagnostic when the humidity percentage is too high. The humidity sensor converts the capacitance across the sensor to a relative humidity. The relative humidity percentage value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	Relative Humidity	>= 106.25 %	Powertrain Relay Voltage for a time LIN Communications established with MAF 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.	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 If application has a LIN MAF: LIN Communications established with MAF 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 (single turbo)	P0101	Detects a performance failure in the Mass Air Flow (MAF) sensor, such as when a MAF value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAF sensor. In this case, the MAF Performance diagnostic	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND	> 25.0 grams/sec > 30.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 350 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria (Coolant Temp OR OBD Max Coolant Achieved Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 5,700 RPM >= -9 Deg C = TRUE) <= 130 Deg C = FALSE) >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		will fail.	Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow -	> 30.0 kPa > 30.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm/sec as a function of engine speed. See table	No Active DTCs: No Pending DTCs:	MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault 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.
			AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm/sec as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed. See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec		MnfdTempSensorCktFP		

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 (Continental MAF)	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. A low MAF frequency is associated with a high engine air flow. 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 mass air flow across the sensor. 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	<= 820 Hertz (>= 600.0 gm/sec)	Engine Run Time Engine Speed Powertrain Relay Voltage Above criteria present for a period of time	> 0.0 seconds >= 300 RPM >= 9.1 Volts >= 0.5 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 (Continental MAF)	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. A high MAF frequency is associated with a low engine air flow. 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 mass air flow across the sensor. 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	>= 13,350 Hertz (<= 0.00 gm/sec)	Engine Run Time Engine Speed Powertrain Relay Voltage Above criteria present for a period of time	> 0.0 seconds >= 300 RPM >= 9.1 Volts >= 0.5 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 (single turbo)	P0106	Detects a performance failure in the Manifold Pressure (MAP) sensor, such as when a MAP value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The MAP sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the MAP performance diagnostic will fail. If the MAP sensor value is within the normal expected atmospheric range, then MAP, Turbocharger Boost Pressure, and Barometric Pressure (BARO) are compared to see if their values are similar. If the Turbocharger Boost Pressure and BARO sensor values are similar, but the MAP value is not similar, then a MAP performance diagnostic will fail.	**Engine Running:** See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE	> 25.0 grams/sec > 30.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 350 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria (Coolant Temp OR OBD Max Coolant Achieved Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 5,700 RPM >= -9 Deg C = TRUE) <= 130 Deg C = FALSE) >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, Turbocharger Boost Pressure sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the MAP sensor. In this case, the MAP Performance diagnostic will fail.	AND Measured TIAP - measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow -	> 30.0 kPa > 30.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm/sec as a function of engine speed See table	No Active DTCs: No Pending DTCs:	multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault 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.
			AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	**P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow** > a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec		MnfdTempSensorCktFP		
			<u>Engine Not Rotating:</u> Manifold Pressure	 < 50.0 kPa	Time between current ignition cycle and the last time the engine was		4 failures out of 5 samples	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			OR Manifold Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	 > 115.0 kPa > 10.0 kPa > 10.0 kPa <= 10.0 kPa	running Engine is not rotating If application has a LIN MAF: LIN Communications established with MAF No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP_LIN1_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP_LIN1_SnsrCktFP	1 sample every 12.5 msec for applications without LIN MAF 1 sample every 25 msec for applications with LIN MAF	

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	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	< 3.3 % of 5 Volt Range (This is equal to 7.5 kPa)	None		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	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	> 78.0 % of 5 Volt Range (This is equal to 336.0 kPa)	None		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)	> 30 deg C > 25 deg C <= 25 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time If application has a LIN MAF: LIN Communications established with MAF 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 If application has a LIN MAF: LIN Communications established with MAF 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	

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.	**<u>Not Good Correlation, IAT3 in Middle:</u>** Power Up IAT3 is between Power Up IAT and Power Up IAT2 AND ABS(Power Up IAT - Power Up IAT2) AND ABS(Power Up IAT3 - Power Up IAT) > ABS(Power Up IAT3 - Power Up IAT2)	> 30 deg C	Time between current ignition cycle and the last time the engine was running Powertrain Relay Voltage for a time If application has a LIN MAF: LIN Communications established with MAF 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	

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 (applications with LIN MAF)	P0112	Detects an erroneously low value being reported over the LIN serial connection from the Intake Air Temperature (IAT) sensor. The diagnostic monitors the IAT sensor output temperature and fails the diagnostic when the IAT temperature is too low. The IAT sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. The temperature value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	IAT Temperature	< -60 degrees C	LIN Communications established with MAF		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 (applications with LIN MAF)	P0113	Detects an erroneously high value being reported over the LIN serial connection from the Intake Air Temperature (IAT) sensor. The diagnostic monitors the IAT sensor output temperature and fails the diagnostic when the IAT temperature is too high. The IAT sensor is a thermistor in which the resistance across the sensor can be equated to a temperature. The temperature value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	IAT Temperature	> 150 degrees C	LIN Communications established with MAF		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	If application has a LIN MAF: LIN Communications established with MAF		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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr1 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr1 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr1 Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7:		No Active DTC's	ECT_Sensor_Ckt_FA EECR_EngineOut_Erratic_TFTKO	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_EngCoolantTempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			2) Sensor low limit 3) Sensor high limit Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. *****************************	150.0 °C 2.5 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Sensor Performance (single turbo)	P0121	Detects a performance failure in the Throttle Position sensor (TPS) sensor, such as when a TPS value is stuck in range. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor and Mass Air Flow (MAF) sensor. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the TPS sensor. In this case, the TPS	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP -	> 25.0 grams/sec > 30.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 350 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria (Coolant Temp OR OBD Max Coolant Achieved Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 5,700 RPM >= -9 Deg C = TRUE) <= 130 Deg C = FALSE) >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		Performance diagnostic will fail.	measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow AND	> 30.0 kPa > 30.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**	No Active DTCs: No Pending DTCs:	MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault 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.
			Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	> a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec		MnfdTempSensorCktFP		

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, 2 or 3: If the maxium energy is greater than as shown in the supporting tables prior to the Engine outlet coolant achieving the target a fault will be indicated. **Range 1 (Primary):** Ambient air temperature is between 10.0 and 52.0 °C Engine Outlet Coolant reaches the start to open temperature of the flow control device to the radiator (ie: thermostat) minus 21.1 °C. The target temperatur for this range will not drop below 66.9 ° C **Range 2 (Secondary):** Ambient air temperature is between -9.0 and 10.0 ° C Engine Outlet Coolant reaches the start to open temperature of the flow control device to the radiator (ie: thermostat) minus 33.0 °C. The target temperatur for this range will not drop below 33.0 °	**P0128 Maximum Acculated Energy - Primary** **P0128 Maximum Acculated Energy - Secondary**	No DTCs Engine soak time Engine run time Engine Outlet Coolant Temperature - Range 1: - Range 2: - Range 3: Devices in main cooling circuit are not in in device control If Engine RPM is continuously greater than for this time period Distance traveled	THMR_AWP_AuxPumpFA THMR_AHV_FA THMR_SWP_Control_FA THMR_SWP_FlowStuckOn_FA THMR_SWP_NoFlow_FA OAT_PtEstFiltFA VehicleSpeedSensor_FA EngineTorqueEstInaccurate MAF_SensorFA ETHR_CoolantEnergyModel ETHR_RemedialActionLevel1 ETHR_RemedialActionLevel2 ETHR_RemedialActionLevel3 EECR_EngineOutlet_FA > 1,800.0 seconds 10.0 - 1,800.0 seconds ≤ 60.0 °C ≤ 10.0 °C ≤ 2.0 °C 9,999 rpm 5.0 seconds ≥ -0.1 km	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.
			C **Range 3 (Tertiary):** Ambient air temperature is between -20.0 and -2.0 °C Engine Outlet Coolant reaches the start to open temperature of the flow control device to the radiator (ie: thermostat) minus 33.0 °C. The target temperatur for this range will not drop below 33.0 ° C	**P0128 Maximum Acculated Energy - Tertiary** This diagnostic models the net energy into and out of the cooling system during the warm-up process. The ten energy terms are: heat from combustion (with AFM correction), heat from after-run, heat loss to transmission oil, heat loss to enviroment, heat loss to cabin, heat loss to DFCO, heat loss to engine oil, heat loss to exhaust, and eat loss to autostop.				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit Low Voltage Bank 1 Sensor 1 (For use with WRAF - Gen4 ECM	P0131	This DTC determines if the WRAF O2 sensor signal circuit is shorted low. This DTC will detect a short to ground fault to the Pump Current, Reference Cell Voltage, Reference Ground and Trim circuits. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B1S1 WRAF ASIC indicates a ground short to any of the following WRAF signals: A) Pump Current - short to ground fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to ground fail counts are accumulated to determine fault status. C) Reference Ground - short to ground fail counts are accumulated to determine fault status. D) Trim circuit - short to ground fail counts are accumulated to determine fault status. Note: This ASIC is referred to as ATIC142 (Continental). Note: A ground short on the Pump Current or Reference Voltage signal may also set a P223C DTC.	The ASIC provides a fault indication when the pump current, reference cell or reference ground pin is < 150mV. Note: the faults must exist for previous 100 milli - seconds to qualify for a fail flag. The four fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	Signal A: 20 failures out of 24 samples OR Signal B: 20 failures out of 24 samples OR Signal C: 20 failures out of 24 samples OR Signal D: 20 failures out of 24 samples Continuous in 25 milli - second loop	Type B, 2 Trips
			B1S1 WRAF ASIC indicates a ground short to any of the following WRAF signals:	The ASIC provides a fault indication when the pump current, reference cell, reference ground or	B1S1 DTC's Not active this key cycle Measure Valid status (ASIC)	P0135, P0030, P0031 or P0032 = Valid	Signal A: 20 failures out of 24 samples OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			A) Pump Current - short to ground fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to ground fail counts are accumulated to determine fault status. C) Reference Ground - short to ground fail counts are accumulated to determine fault status. D) Trim circuit - short to ground fail counts are accumulated to determine fault status. <u>Note</u>: This ASIC is referred to as CJ136 (next Gen version of CJ135 from Bosch).	trim circuit fails the following criteria; |Nernst signal - 0.45| >1.0 volts OR |Voltage drop over Rgnd - (internal current source *Rgnd)| > 0.5 volts OR CJ136 H/W detection Note: the faults must exist for previous 10 milli - seconds to qualify for a fail flag. The four fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	= Ready = True = Complete ≥ 20.0 seconds	Signal B: 20 failures out of 24 samples OR Signal C: 20 failures out of 24 samples OR Signal D: 20 failures out of 24 samples Continuous in 25 milli - second loop	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S Circuit High Voltage Bank 1 Sensor 1 (For use with WRAF - Gen4 ECM	P0132	This DTC determines if the WRAF O2 sensor signal circuit is shorted high. This DTC will detect a short to power fault to the Pump Current, Reference Cell Voltage, Reference Ground and Trim circuit. When enabled, the diagnostic monitors the three different failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the three individual fail and sample counters.	B1S1 WRAF ASIC indicates a short to power on any of the following WRAF signals: A) Pump Current - short to power fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to power fail counts are accumulated to determine fault status. C) Reference Ground - short to power fail counts are accumulated to determine fault status. D) Trim Circuit - short to power fail counts are accumulated to determine fault status Note: This ASIC is referred to as ATIC142 (Continental)..	The ASIC provides a fault indication when the pump current, reference cell, reference ground or trim circuit pin is ≥ 5.2V. Note: the faults must exist for more than 100 msec to qualify for a fail flag. The four fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid Status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	Signal A: 20 failures out of 24 samples OR Signal B: 20 failures out of 24 samples OR Signal C: 20 failures out of 24 samples OR Signal D: 20 failures out of 24 samples Frequency: Continuous in 25 milli - second loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			B1S1 WRAF ASIC indicates a short to power on any of the following WRAF signals: A) Pump Current - short to power fail counts are accumulated to determine fault status. B) Reference Cell Voltage - short to power fail counts are accumulated to determine fault status. C) Reference Ground - short to power fail counts are accumulated to determine fault status. D) Trim Circuit - short to power fail counts are accumulated to determine fault status Note: This ASIC is referred to as CJ136 (next Gen of CJ135 from Bosch).	The ASIC provides a fault indication when the pump current, reference cell, reference ground or trim circuit pin fail the following criteria; CJ136 H/W detection Note: the faults must exist for more than 10 msec to qualify for a fail flag. The four fault signals have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	B1S1 DTC's Not active this key cycle Measure Valid Status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	P0135, P0030, P0031 or P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	Signal A: 20 failures out of 24 samples OR Signal B: 20 failures out of 24 samples OR Signal C: 20 failures out of 24 samples OR Signal D: 20 failures out of 24 samples Frequency: Continuous in 25 milli - second loop	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2S 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 < 4.0	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 > 11.0 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 11.0 < 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 ≤ 1.040 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 Estimation in Progress Fuel State All of the above met for	Enabled (On) Ethanol ≤ 87 % = Not Active (Please see "**Ethanol Estimation in Progress**" in Supporting Tables). 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 11.0 < 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 ≤ 1.040 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 repass limit is 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 ≤ 7.2 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 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 O2S_Bank_ 1_TFTKO O2S_Bank_ 2_TFTKO P013B, P013E, P013F, P2270 or P2271 > 11.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec.	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between an upper and lower voltage threshold. The response rate is then normalized to mass air flow rate and scaled resulting in a normalized intregral value. The normalized integral is fed into a 1st order lag filter to update the final EWMA result. DTC P013A is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method:			Low Fuel Condition Only when FuelLevelDataFault Post fuel cell Crankshaft Torque DTC's Passed =================== After above conditions are met: DFCO mode is continued (wo driver initiated pedal input).	= False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. < 125.0 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 repass limit is 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 ≤ 7.2 units > 200 grams (lower voltage threshold is 350 mvolts and upper voltage threshold is 600 mvolts)	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance 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 O2S_Bank_ 1_TFTKO O2S_Bank_ 2_TFTKO P013A, P013E, P013F, P2270 or P2271 > 11.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		between an lower and upper voltage threshold. The response rate is then normalized to mass air flow rate and scaled resulting in a normalized intregral value. The normalized integral is fed into a 1st order lag filter to update the final EWMA result. DTC P013B is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. Secondary method:			 Green Cat System Condition Low Fuel Condition Only when FuelLevelDataFault Post fuel cell DTC's Passed =================== After above conditions are met: Fuel Enrich mode continued. =================	is above 22.0 grams/sec. = Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 360,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 22.0 grams/ sec. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service). = False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. P2270 P013E P013A P2271 P013F ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		This fault is set if the secondary O2 sensor does not achieve the required upper voltage threshold before the accumulated mass air flow threshold is reached.			During this test the following must stay TRUE or the test will abort: 0.951 ≤ Base Commanded 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 > 1 secs ≥ 3.0 grams	No Active DTC's B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance 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 O2S_Bank_ 1_TFTKO O2S_Bank_ 2_TFTKO P013A, P013B, P013F, P2270 or P2271 > 11.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = 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.
					  Low Fuel Condition Only when FuelLevelDataFault Post fuel cell Crankshaft Torque DTC's Passed Number of fueled cylinders ================== After above conditions are met: DFCO mode entered (wo driver initiated pedal input).	is above 22.0 grams/sec. = False = False = Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info. < 125.0 Nm P2270 ≤ 3 cylinders ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 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 B1S2 DTC's Not Active this key cycle System Voltage Learned heater resistance 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 O2S_Bank_ 1_TFTKO O2S_Bank_ 2_TFTKO P013A, P013B, P013E, P2270 or P2271 > 11.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Green Cat System Condition	= Not Valid, Green Cat System condition is considered valid until accumulated airflow is greater than 360,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is greater than 22.0 grams/ sec. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service).		
					Low Fuel Condition	= False		
					Only when FuelLevelDataFault	= False		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					DTC's Passed	P2270 P013E P013A P2271		
					Number of fueled cylinders	≥ 1 cylinders		
					===================	==================		
					After above conditions are met: Fuel Enrich mode entered.			
					=================			
					During this test the			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					following must stay TRUE or the test will abort: 0.951 ≤ Base Commanded EQR ≤ 1.100 ================= During this test: Engine Airflow must stay: and the delta Engine Airflow over 12.5msec must be :	gps ≤ 20.0 KePOPD_dm_L2R_AirFlowMaxAbor ≤ KePOPD_dm_L2R_AirFlowDeltaAbortgps		

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 > 11.0 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 with WRAF	P015A	DTC P015A detects that the primary WRAF oxygen sensor for Bank 1 has delayed response when the air fuel ratio transitions from rich to lean condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor rich to lean tests (P013E / P013A / P2271), which commands fuel cut off. Note: The Primary method is used when the primary WRAF O2 sensor signal transitions from above to below the O2 measured EQR threshold, otherwise the Secondary method is used. Primary method: The P015A diagnostic measures the primary WRAF O2 sensor response time between a rich condition above a starting measured EQR threshold and a lower measured EQR threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro,	Primary method: The EWMA of the Pre O2 sensor normalized R2L time delay value. The EWMA repass limit is The EWMA calculation uses a 0.25 coefficient. This method calculates the result when the WRAF O2 sensor measured EQR is OR Secondary Method: The Accumulated time monitored during the R2L Delayed Response Test. AND Pre WRAF O2 sensor measured EQR is	> 0.60 EWMA (sec) ≤ 0.58 EWMA (sec) < 0.800 EQR ≥ 3.5 Seconds > 0.300 EQR	No Active DTC's System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault Green O2S Condition	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA WRAF_Bank_1_FA P0131, P0132, P013A, P013B, P013E, P013F, P2270, P2271 > 11.0 Volts = Not active = Not active = Not active = Not active = False = False = Not Valid,	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		and intake air temperature resulting in a normalized delay value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015A is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary WRAF O2 sensor does not achieve the required lower measured EQR			 O2 Heater (pre sensor) on for Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral Closed Loop Active	Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 30 seconds > 60 ºC = TRUE) > -40 ºC > 30 seconds 950 ≤ RPM ≤ 2,950 900 ≤ RPM ≤ 3,050 2.0 ≤ gps ≤ 20.0 40.4 ≤ MPH ≤ 77.7 35.4 ≤ MPH ≤ 82.0 0.85 ≤ C/L Int ≤ 1.08 = 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.
		threshold before a delay time threshold is reached.			Evap Ethanol Estimation in Progress Baro Post fuel cell EGR Intrusive diagnostic All post sensor heater delays O2S Heater (post sensor) on Time Predicted Catalyst temp Fuel State ================== All of the above met for at least 1.2 seconds, and then the Force Cat Rich intrusive stage is requested. ================== Pre O2S EQR B1S1 at end of Cat Rich stage Fuel State Number of fueled cylinders ================== After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input).	not in control of purge = Not Active (Please see "**Ethanol Estimation in Progress**" in Supporting Tables). > 70 kpa = enabled = not active = not active ≥ 60.0 sec 500 ≤ ºC ≤ 900 = DFCO possible ================== ================== ≥ 1.170 EQR = DFCO active ≤ 3 cylinders ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 1) (For use with WRAF	P015B	DTC P015B detects that the primary WRAF oxygen sensor for Bank 1 has delayed response when the air fuel ratio transitions from lean to rich condition. This diagnostic runs simultaneously with the intrusive secondary O2 monitor lean to rich tests (P013F / P013B), which commands fuel enrichment. Note: The Primary method is used when the primary WRAF O2 sensor signal transitions from lean condition to above the O2 measured EQR threshold, otherwise the Secondary method is used. <u>Primary method</u>: The P015B diagnostic measures the primary WRAF O2 sensor response time between a lean condition and a higher measured EQR threshold. The response time is then scaled and normalized to mass air flow rate, engine speed, Baro, and intake air temperature resulting in	Primary method: The EWMA of the Pre O2 sensor normalized L2R time delay value. The EWMA repass limit is The EWMA calculation uses a 0.25 coefficient. OR Secondary method: The Accumulated time monitored during the L2R Delayed Response Test. AND Pre WRAF O2 sensor measured EQR is OR At end of Cat Rich stage the Pre WRAF O2 sensor measured EQR is	> 0.60 EWMA (sec) ≤ 0.58 EWMA (sec) ≥ 4.0 Seconds < 0.996 EQR < 1.170 EQR	No Active DTC's P015A test is complete and System Voltage EGR Device Control Idle Device Control Fuel Device Control AIR Device Control Low Fuel Condition Only when FuelLevelDataFault	TPS_ThrottleAuthorityDefaulted MAP_SensorFA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault MAF_SensorFA EvapPurgeSolenoidCircuit_FA EvapFlowDuringNonPurge_FA EvapVentSolenoidCircuit_FA EvapSmallLeak_FA EvapEmissionSystem_FA FuelTankPressureSnsrCkt_FA FuelInjectorCircuit_FA AIR System FA FuelTrimSystemB1_FA FuelTrimSystemB2_FA EthanolCompositionSensor_FA EngineMisfireDetected_FA WRAF_Bank_1_FA P0131, P0132, P013A, P013B, P013E, P013F, P015A, P2270, P2271 = Passed > 11.0 Volts = Not active = Not active = Not active = Not active = False = False	Frequency: Once per trip Note: if NaESPD_b_FastInitRespIsActive = TRUE for the given Fuel Bank OR NaESPD_b_RapidResponseIsActive = TRUE, multiple tests per trip are allowed	Type A, 1 Trips EWMA

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		a normalized delay value. The normalized delay is fed into a 1st order lag filter to update the final EWMA result. DTC P015B is set when the EWMA value exceeds the EWMA threshold. Note: This EWMA diagnostic employs two features, Fast Initial Response (FIR) and Rapid Step Response (RSR). The FIR feature is used following a code clear event or any event that results in erasure of the engine controller's non-volatile memory. The RSR feature is used when a step change in the test result is identified. Both these temporary features improve the EWMA result following a non-typical event by allowing multiple intrusive tests on a given trip until the total number of tests reach a calibration value. <u>Secondary method</u>: This fault is set if the primary WRAF O2 sensor does not achieve the required higher measured EQR threshold before a delay time threshold is			Green O2S Condition O2 Heater (pre sensor) on for Engine Coolant (Or OBD Coolant Enable Criteria IAT Engine run Accum Engine Speed to initially enable test Engine Speed range to keep test enabled (after initially enabled) Engine Airflow Vehicle Speed to initially enable test Vehicle Speed range to keep test enabled (after initially enabled) Closed loop integral Closed Loop Active	= Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S1, B2S1 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow is above 22.0 grams/sec. ≥ 30 seconds > 60 ºC = TRUE) > -40 ºC > 30 seconds 950 ≤ RPM ≤ 2,950 900 ≤ RPM ≤ 3,050 2.0 ≤ gps ≤ 20.0 40.4 ≤ MPH ≤ 77.7 35.4 ≤ MPH ≤ 82.0 0.85 ≤ C/L Int ≤ 1.08 = TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		reached.			 Evap Ethanol Estimation in Progress 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 :	(Please see "**Closed Loop Enable Clarification**" in Supporting Tables). not in control of purge = Not Active (Please see "**Ethanol Estimation in Progress**" in Supporting Tables). > 70 kpa = enabled = not active = not active ≥ 60.0 sec 500 ≤ ºC ≤ 900 = DFCO inhibit ≥ 1 cylinders ================== ================== 0 ≤ gps ≤ 30 ≤ 30.0 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)	>= 1.395 >= 0.100 If a fault has been detected the long-term fuel trim metric must be < 1.350 and the short-term fuel trim metric must be < 2.000 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	525 <rpm< 5,700 > 70 kPa > -20 °C (or OBD Coolant Enable Criteria = TRUE) < 160 °C 10 <kPa< 255 -20 <°C< 160 1 <g/s< 1,000 > 10 % or if fuel sender is faulty the diagnostic will bypass the fuel level criteria. > 20.00 seconds of data must accumulate on each trip, with at least 10.00 seconds of data in the current fuel trim cell before a pass or fail decision can be made. Additional time can be required for cold ambient starts to accommodate larger minimum LTM's for startability reasons. See **Startup Engine Coolant adjusment to Minimum accumulation time** . (Please see **P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage** in Supporting Tables for a list of cells utilized for diagnosis)	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.
					Closed Loop Long Term FT EGR Diag. Catalyst Diag. Post O2 Diag. Device Control EVAP Diag. No active DTC:	Enabled Enabled (Please see "**Closed Loop Enable Clarification**" and "**Long Term FT Enable Criteria**" in Supporting Tables.) 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)	<= 0.740 <= 2.000 ************************* <= 0.745 <= 0.740 <= 2.000 If a fault has been detected (by the passive or intrusive test) the long-term fuel trim metric must be > 0.780 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. ***************************** <= 25.11 % Intrusive Test is inhibited when Purge Vapor percentage is greater than this threshold. (Note: values greater than 50% indicate the Purge Vapor Fuel requirement is not being used) A minimum number of accumlated Fuel Trim Data samples are required to adequately learn a correct Purge Vapor Fuel value. See the table **Minimum Non-Purge Samples for Purge** (**Vapor Fuel**) for the Purge Off cells used to validate the Purge Vapor Fuel parameter.	Frequency: 100 ms Continuous Loop ****************** **Segment Definition:** Segments can last up to 42 seconds and are separated by the lesser of 10.00 seconds of purge-on time or enough time to purge 10 grams of vapor. A maximum of 3 completed segments or 15 attempts are allowed for each intrusive test. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient	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 > 0.745 , 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 <= 0.745 , 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 <= 0.740 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 > 0.000 to repass the diagnostic. The intrusive test will be enabled at long-term fuel metric values < 0.79 until the diagnostic repasses after a failure.		If the accumulated purge volume is > 1,200.0 grams, the intrusive test will not be inhibited even if Purge Vapor Fuel is > 25.1 %.	time to purge excess vapors from the canister. During this period, fuel trim will pass if the filtered Purge Long Term Fuel Trim metric > 0.745 for at least 120.00 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 KeFDBR_cmp_FPSS_MinPres Variance ; 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	Sensed fuel pressure change [absolute value, during intrusive test]	<= 30 kPa	a) Diagnostic enabled [FDBR_b_FPSS_DiagEnbld] b) Timer Engine Running [FDBR_t_EngModeRunCoarse] c1) Fuel Flow Rate Valid c2) FDB_FuelPresSnsrCktFA c3) Reference Voltage Fault Status [DTC P0641] c4) FAB_FuelPmpCktFA c5) Fuel Control Enable Fault Active [DTC P12A6] c6) Fuel Pump Driver Module OverTemp Fault Active [DTC P1255] c7) Fuel Pump Speed Fault Active [DTC P129F] c8) CAN Sensor Bus message $0C3 Comm Fault [CFMR_b_FTZM_Info1_UcodeCmFA DTC P165C] c9) CAN Sensor Bus Fuel Pmp Spd Command ARC and Checksum Comm Fault Code [CFMR_b_FTZM_Cmd1_UcodeCmFA DTC]	a) == TRUE b) >= 5.00 seconds c1) == TRUE c2) <> TRUE c3) <> TRUE c4] <> TRUE c5) <> TRUE c6) <> TRUE c7) <> TRUE c8) <> TRUE c9] <> 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.
					c10) Fuel Pump Duty Cycle Fault Active c11) Sensor Configuration [FDBR_e_FuelPresSnsrConfig] c12) Sensor Bus Relay On d) Emissions Fuel Level Low [Message $3FB] e) Fuel Control Enable f) Fuel Pump Control State g) Instantaneous Fuel Flow [FCBR_dm_InstFuelFlow] h) Diagnostic System Disabled [DRER_b_DiagSysDsb] j1) Fuel Pmp Speed Command Alive Rolling Count and Checksum Error [CAN Bus B $0CE] [CFMR_b_FTZM_Cmd1_ARC_ChkErr DTC] j2) CAN Sensor Bus message $0C3_Available j3) Fuel Pres Sensor Ref Voltage Status Message Counter Incorrect Alive Rolling Count and	c10) <> TRUE c11) == CeFDBR_e_WiredTo_ECM c12) == TRUE d) <> TRUE e) == TRUE f) == Normal Control OR == Fuel Pres Sensor Stuck Control g) >= 0.05 gm/sec h) <> TRUE j1) <> TRUE j2) == TRUE j3) <> TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Checksum Error [CAN Bus B $0C3] [CFMR_b_FTZM_Info1_ARC_ChkErr DTC]			

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 Values are analyzed as percent of sensor reference voltage [[Abs [5.0V - SensorVoltsActual] / 5.0V] *100%]	Fuel Pressure Sensor output % [re. full range as percent of 5.0V reference]	< 4.00 % or [0 kPa gauge]	a) Diagnostic enabled [FDBR_b_FPSnsrCktLoDiagEnbl] b) Run_Crank Active [PMDR_b_RunCrankActive c) Diagnostic System Disabled [DRER_b_DiagSysDsbl] d) Pressure Sensor Configuration [FDBR_e_FuelPresSnsrConfig]	a) == TRUE b) == TRUE c) <> TRUE d1) IF calibration CeFDBR_e_WiredTo_ECM == WiredTo ECM d2) IF NOT, then see Case2	64.00 failures / 80.00 samples 1 sample/12.5 ms	Type B, 2 Trips
			Fuel Pressure Sensor output % [re. full range as percent of 5.0V reference]	< 4.00 % or [0 kPa gauge]	a) Diagnostic enabled [FDBR_b_FPSnsrCktLoDiagEnbl] b) Run_Crank Active [PMDR_b_RunCrankActive c) Diagnostic System Disabled [DRER_b_DiagSysDsbl] d1) Pressure Sensor Configuration [FDBR_e_FuelPresSnsrConfig] d2) Sensor Bus Relay On d3) CAN Sensor Bus message $0C3_Available d4) Fuel Pres Sensor Ref	a) == TRUE b) == TRUE c) <> TRUE d1) IF calibration CeFDBR_e_WiredTo_ECM == WiredTo FTZM d2) == TRUE d3) == TRUE d4) <> TRUE	64.00 failures / 80.00 samples 1 sample/12.5 ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Voltage Status Message Counter Incorrect Alive Rolling Count and Checksum Error [CAN Bus B $0C3] [CFMR_b_FTZM_Info1_ARC_ChkErr DTC]	d2) IF calibration CeFDBR_e_WiredTo_ECM <> WiredTo FTZM, then see Case1		

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 Values are analyzed as percent of sensor reference voltage [[Abs [5.0V - SensorVoltsActual] / 5.0V] *100%]	Fuel Pressure Sensor output % [re. full range as percent of 5.0V reference]	> 96.00 % or [743 kPa ga]	a) Diagnostic enabled [FDBR_b_FPSnsrCktLoDiagEnbl] b) Run_Crank Active [PMDR_b_RunCrankActive c) Diagnostic System Disabled [DRER_b_DiagSysDsbl] d) Pressure Sensor Configuration [FDBR_e_FuelPresSnsrConfig]	a) == TRUE b) == TRUE c) <> TRUE d1) IF calibration CeFDBR_e_WiredTo_ECM == WiredTo ECM d2) IF NOT, then see Case2	64.00 failures / 80.00 samples 1 sample/12.5 ms	Type B, 2 Trips
			Fuel Pressure Sensor output % [re. full range as percent of 5.0V reference]	> 96.00 % or [743 kPa ga]	a) Diagnostic enabled [FDBR_b_FPSnsrCktLoDiagEnbl] b) Run_Crank Active [PMDR_b_RunCrankActive c) Diagnostic System Disabled [DRER_b_DiagSysDsbl] d1) Pressure Sensor Configuration [FDBR_e_FuelPresSnsrConfig] d2) Sensor Bus Relay On d3) CAN Sensor Bus message $0C3_Available d4) Fuel Pres Sensor Ref	a) == TRUE b) == TRUE c) <> TRUE d1) IF calibration CeFDBR_e_WiredTo_ECM == WiredTo FTZM d2) == TRUE d3) == TRUE d4) <> TRUE	64.00 failures / 80.00 samples 1 sample/12.5 ms	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Voltage Status Message Counter Incorrect Alive Rolling Count and Checksum Error [CAN Bus B $0C3] [CFMR_b_FTZM_Info1_ARC_ChkErr DTC]	d2) IF calibration CeFDBR_e_WiredTo_ECM <> WiredTo FTZM, then see Case1		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure Sensor 1 Out of Range	P0192	This DTC diagnose SENT high pressure sensor 1 that is too low out of range. If the sensor digital value (represnting the refernce voltage) is below the lower digital threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	High Pressure Rail Sensor 1 SENT digital read value	=< 66			Time Based: 400 Failuer out of 500 Samples 6.25 ms per Sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Temperature (EOT) Circuit Low	P0197	Controller specific output driver circuit diagnoses the Engine Oil Temperature (EOT) Sensor 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.	Engine Oil Temperature Sensor (EOT) Circuit Resistance	< 25 ohms	Diagnostic Status	Enabled	4 failures out of 5 samples Sampled every 1 second	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 Temperature (EOT) Circuit High	P0198	Controller specific output driver circuit diagnoses the Engine Oil Temperature (EOT) Sensor 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.	Engine Oil Temperature Sensor (EOT) Circuit Resistance	> 450,000 ohms	Diagnostic Status Engine Run Time OR ECT	Enabled > 20.0 seconds >= -20 Deg C	4 failures out of 5 samples Sampled every 1 second	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 Temperature Sensor (EOT) Circuit Intermittent	P0199	Determines if an intermittent fault exists on the engine oil temperature sensor circuit. This diagnostic compares each temperature sample to the previous sample and measures cumulative error over a sample period.	**Continuous Test** <u>Pass/Fail Condition:</u> Temperature signal string length, cumulative sum of absolute value of (Oil Temperature - Previous Oil Temperature)	String Length >= 10.00 °C	None	Enabled AND EngOilTempFA = FALSE	4 failures out of 5 samples, sampled every 2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Temperature Sensor B Circuit Low	P01BB	Controller specific output driver circuit diagnoses the Engine Oil Temperature Sensor B 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.	Engine Oil Temperature Sensor B Circuit Resistance	< 25 ohms	Diagnostic Status	Enabled	4 failures out of 5 samples Sampled every 1 second	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 Temperature Sensor B Circuit High	P01BC	Controller specific output driver circuit diagnoses the Engine Oil Temperature Sensor B 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.	Engine Oil Temperature Sensor B Circuit Resistance	> 450,000 ohms	Diagnostic Status Engine Run Time OR ECT	Enabled > 20.0 seconds >= -20 Deg C	4 failures out of 5 samples Sampled every 1 second	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 Temperature Sensor B Circuit Intermittent	P01BD	Determines if an intermittent fault exists on the engine oil temperature sensor B circuit. This diagnostic compares each temperature sample to the previous sample and measures cumulative error over a sample period.	**Continuous Test** <u>Pass/Fail Condition:</u> Temperature signal string length, cumulative sum of absolute value of (Oil Temperature - Previous Oil Temperature)	String Length >= 10.00 °C	None	Enabled AND EngOilTempFA = FALSE	4 failures out of 5 samples, sampled every 2 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 3 Circuit Low	P01E5	Circuit Continuity This DTC detects a short to ground in the a temperature sensor signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr3 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 3 Circuit High	P01E6	Circuit Continuity This DTC detects a short to high or open in a temperature signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 3 Circuit Intermittent/ Erratic	P01E7	Circuit Erratic This DTC detects large step changes in a temperature signal circuit or the temperature 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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr3 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4		No Active DTC's	EECR_TS3_Erratic_TFTKO EECR_TS3_CktHiLo_FA	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. *****************************	 2.5 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Coolant Temperature Dropped Below Diagnostic Monitoring Temperature - ATM	P01F0	This DTC detects an unexplained cooling system cool down below the OBD monitoring threshold during normal operating conditions. This check is run throughout the key cycle.	Engine outlet coolant temperature drops below for an unexpected reason	65.0 °C	No Active DTC's	ECT_Sensor_Ckt_FA VehicleSpeedSensor_FA OAT_PtEstFiltFA THMR_AWP_AuxPumpFA THMR_AHV_FA THMR_SWP_Control_FA EngineTorqueEstInaccurate ECT_Sensor_Perf_FA THMR_SWP_NoFlow_FA THMR_SWP_FlowStuckOn_FA	30 seconds out of a 60 seconds window	
					Engine Runtime	≥ 30.0 seconds		
					Distance traveled this key cycle	≥ 1.2 km		
					Ambient air pressure	≥ 55.0 kPa		
					Ambient air temperature	≥ -9.0 °C		
					**************************			
					Engine coolant temperature At least once during the key cycle Type 0 (non-heated t-stat)	≥ 66.9 °C		
					**************************			
					Heat to coolant	≥ **P01F0 - Heat To Coolant Min 2D**		
					DFCO time	≤ 28.0 seconds		
					Thermostat duty cycle	≤ 101.0 %		
					RPM	≤ 8,192		
					Active Fuel Management is not in	Half Cylinder Mode		

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 Run Time	>= 11 Volts >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 Run Time	>= 11 Volts >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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.
Turbocharger Boost Pressure (TIAP) Sensor Performance (single turbo)	P0236	Detects a performance failure in the Turbocharger Boost Pressure sensor, such as when a Turbocharger Boost Pressure value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The Turbocharger Boost Pressure sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the Turbocharger Boost Pressure performance diagnostic will fail. If the Turbocharger Boost Pressure sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure and Barometric Pressure (BARO) are compared to see if their values are similar. If the MAP and BARO sensor values are similar, but the Turbocharger Boost Pressure value is not	**Engine Running:** See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP - TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP -	> 25.0 grams/sec > 30.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 350 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria (Coolant Temp OR OBD Max Coolant Achieved Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 5,700 RPM >= -9 Deg C = TRUE) <= 130 Deg C = FALSE) >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM** MAP Model 2 Error	Continuous Calculation are performed every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		similar, then a Turbocharger Boost Pressure performance diagnostic will fail. The engine running portion of this diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from other sensors. The other sensors are the Mass Air Flow (MAF) sensor, Manifold Pressure (MAP) sensor and Throttle Position sensor (TPS). These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with the Turbocharger Boost Pressure sensor. In this case, the Turbocharger Boost Pressure Performance	measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow	> 30.0 kPa > 30.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**	No Active DTCs: No Pending DTCs:	multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault EGRValve_FP ECT_Sensor_Ckt_FP IAT_SensorCircuitFP MnfdTempSensorCktFP		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		diagnostic will fail.	AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	> a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm/sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec				
			Engine Not Rotating: Turbocharger Boost Pressure OR Turbocharger Boost	< 50.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating	> 10.0 seconds	4 failures out of 5 samples 1 sample every 12.5 msec for applications	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	> 115.0 kPa <= 10.0 kPa > 10.0 kPa > 10.0 kPa	If application has a LIN MAF: LIN Communications established with MAF No Active DTCs: No Pending DTCs:	EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP_LIN1_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP_LIN1_SnsrCktFP	without LIN MAF 1 sample every 25 msec for applications with LIN MAF	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Pressure Sensor Circuit Low	P0237	Detects a continuous short to ground in the Turbocharger Boost Pressure signal circuit by monitoring the Turbocharger Boost Pressure sensor output voltage and failing the diagnostic when the Turbocharger Boost Pressure voltage is too low. The Turbocharger Boost Pressure sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	Turbocharger Boost Pressure Voltage	< 14.4 % of 5 Volt Range (This is equal to 50.0 kPa)	None		320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Boost Pressure Sensor Circuit High	P0238	Detects a continuous short to power or open circuit in the Turbocharger Boost Pressure signal circuit by monitoring the Turbocharger Boost Pressure sensor output voltage and failing the diagnostic when the Turbocharger Boost Pressure voltage is too high. The Turbocharger Boost Pressure sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure.	Turbocharger Boost Pressure Voltage	> 78.0 % of 5 Volt Range (This is equal to 336.0 kPa)	None		320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid A Control Circuit Low	P0245	Controller specific output driver circuit diagnostic, diagnosing the 'turbocharger boost solenoid 'A' actuator' low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A'is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground. In certain controllers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedance between output and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	10 failures out of 14 samples 100ms / sample	Type A, 1 Trips Note: In certain controllers P0243 may also set turbocharger wastegate / supercharger boost solenoid A control circuit

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbocharger Wastegate / Supercharger Boost Solenoid A Control Circuit High	P0246	Controller specific output driver circuit diagnostic, diagnosing the 'turbocharger boost solenoid 'A' actuator' low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In a parallel application, turbocharger 'A'is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power. In certain controllers this diagnosis runs only when the HWIO-output is driven by the application S/W.	≤ 0.5 Ω impedance between output and controller power	Diagnostic enabled ***************************** Powertrain relay voltage Ignition run crank voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts > 5.00 Volts *****************************	10 failures out of 14 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 samples 100 ms /sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Engine Underboost Wastegate Position Deviation; Turbocharger with electronic wastegate.	P0299	This DTC indicates a wastegate position deviation which will lead into an underboost situation.	Wastegate Position deviation Error = (Expected Wastegate Position - Actual Wastegate Position)	< refer to **P0299: WG negative deviation fail threshold over engine speed and desired torque.** + **P0299: Additive offset on WG negative deviation ambient correction.** in Supporting tables.	Dev. Diagnostic enable ***************************** Coolant temperature or OBD Coolant Enable Criteria and Coolant temperature and not OBD Max Coolant Achived ***************************** Engine speed ***************************** Desired Torque ***************************** Desired Torque derivative in range Actual wastegate position in range Actual wastegate position derivative in range ***************************** All conditions haveto be fullfilled for:	True ***************************** > -40.0 °C < 150.0 °C ***************************** > refer to **P0234 P0299: Engine speed minimum limit over Ambient pressure to enable the WG deviation diagnosis.** in Supporting tables. ***************************** > refer to **P0234 P0299: Desired torque minimum limit overAmbient pressure to enable the WG deviation diagnosis.** in Supporting tables ***************************** > -30.00 Nm/sec < 30.00 Nm/sec > 20.00 % < 100.00 % > -20.00 %/sec < 20.00 %/sec ***************************** > refer to	50 failures out of 62 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					**************************** No active DTCs: **************************** No device control active for compresseor recirculation valve.	**P0234 P0299: Wastegate position deviation diagnostic enable delay as a function of engine speed and ambient pressure** in Supporting table **************************** WGAR_b_WG_CktFA NaWGAR_b_PstnCntrlFA CRAR_b_CRV_CktFA ECT_Sensor_FA IAT_SensorFA BSTR_b_BoostSnsrFA AmbientAirDefault MAF_SensorFA ****************************		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Injector Circuit Range/ Performance	P02EE	Diagnostic to determine if Cylinder 1 injector voltage feedback measured from the analog to digital converter is rational. The measured voltage is checked when the injection pulse width is large enough ensuring the injector pintle has achieved max travel and the injector voltage flux through the coil has reach the max stabilization limit	Injector voltage feedback is not able to detect an opening magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Injector voltage feedback is not able to detect a closing time OR Measured Voltage feedback converted to Injector closing time OR Measured Voltage	=< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Opening Magnitude** (See supporting table) >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Opening Magnitude** (See supporting table) =< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Closing Time** (See supporting table) >=	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Valid (See Definition in Supporting Material below) Injection Pulse Width	= True >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Voltage Feedback Rationalities Minimum Pulse Width**	100.00 failures out of 125.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			feedback converted to Injector closing time	**P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Closing Time** (See supporting table)				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Injector Circuit Range/ Performance	P02EF	Diagnostic to determine if Cylinder 2 injector voltage feedback measured from the analog to digital converter is rational. The measured voltage is checked when the injection pulse width is large enough ensuring the injector pintle has achieved max travel and the injector voltage flux through the coil has reach the max stabilization limit	Injector voltage feedback is not able to detect an opening magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Injector voltage feedback is not able to detect a closing time OR Measured Voltage feedback converted to Injector closing time OR Measured Voltage	=< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Opening Magnitude** (See supporting table) >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Opening Magnitude** (See supporting table) =< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Closing Time** (See supporting table) >=	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Valid (See Definition in Supporting Material below) Injection Pulse Width	= True >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Voltage Feedback Rationalities Minimum Pulse Width**	100.00 failures out of 125.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			feedback converted to Injector closing time	**P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Closing Time** (See supporting table)				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 3 Injector Circuit Range/ Performance	P02F0	Diagnostic to determine if Cylinder 3 injector voltage feedback measured from the analog to digital converter is rational. The measured voltage is checked when the injection pulse width is large enough ensuring the injector pintle has achieved max travel and the injector voltage flux through the coil has reach the max stabilization limit	Injector voltage feedback is not able to detect an opening magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Injector voltage feedback is not able to detect a closing time OR Measured Voltage feedback converted to Injector closing time OR Measured Voltage	=< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Opening Magnitude** (See supporting table) >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Opening Magnitude** (See supporting table) =< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Closing Time** (See supporting table) >=	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Valid (See Definition in Supporting Material below) Injection Pulse Width	= True >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Voltage Feedback Rationalities Minimum Pulse Width**	100.00 failures out of 125.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			feedback converted to Injector closing time	**P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Closing Time** (See supporting table)				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Injector Circuit Range/ Performance	P02F1	Diagnostic to determine if Cylinder 4 injector voltage feedback measured from the analog to digital converter is rational. The measured voltage is checked when the injection pulse width is large enough ensuring the injector pintle has achieved max travel and the injector voltage flux through the coil has reach the max stabilization limit	Injector voltage feedback is not able to detect an opening magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Injector voltage feedback is not able to detect a closing time OR Measured Voltage feedback converted to Injector closing time OR Measured Voltage	=< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Opening Magnitude** (See supporting table) >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Opening Magnitude** (See supporting table) =< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Closing Time** (See supporting table) >=	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Valid (See Definition in Supporting Material below) Injection Pulse Width	= True >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Voltage Feedback Rationalities Minimum Pulse Width**	100.00 failures out of 125.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			feedback converted to Injector closing time	**P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Closing Time** (See supporting table)				

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. Emissions Neutral Default Action: If consumed Emissions Neutral Default DTCs from other subsystems are set: Ignore Rough Road, Traction, Stability, and Antilock brake signals. If default action not activated, Misfire Monitor could complete less frequently or inaccurately. Default Action Latched for duration of Trip Default Action: If Misfire P030x sets on some hybrid applications, the isolation damper	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 > **RufSCD_Decel** AND > **RufSCD_Jerk)** > **SCD_Decel** AND > **SCD_Jerk)** > **RufCyl_Decel** AND > **RufCyl_Jerk)** > **CylModeDecel** AND > **CylModeJerk)** >**RevMode_Decel**	Engine Run Time Engine Coolant Temp Or If ECT at startup Then 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 "ECT" If OBD Max Coolant Achieved = FALSE -12 ºC < ECT Or if OBD Max Coolant Achieved = TRUE -12 ºC < ECT < 130 ºC < -12 ºC If OBD Max Coolant Achieved = FALSE 21 ºC < ECT If OBD Max Coolant Achieved = TRUE 21 ºC < ECT < 130 ºC 9.00 < volts < 32.00 < 95.00 % per 25 ms < 95.00 % 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	Type B, 2 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.
		between engine and transmission can go into extreme resonance. Default action is to move rpm out of the resonance zone. If default action not activated, significant hardware damage could occur rendering vehicle inoperable.	****************************** **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 ************************** > 6 Engine Cycles > **RufSCD_Decel** * **Random_SCD_Decel** >**RufSCD_Jerk** * **Random_SCD_Jerk** > **SCD_Decel** * **Random_SCD_Decel** > **SCD_Jerk** * **Random_SCD_Jerk** > **RufCyl_Decel** * **RandomCylModDecel** > **RufCyl_Jerk** * **RandomCylModJerk**			any Catalyst Exceedence = (1) 200 rev block as data supports for catalyst damage. 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)	> **RufSCD_Decel * Pair_SCD_Decel** > **RufSCD_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)	> **RufCyl_Decel** * **PairCylModeDecel** > **RufCyl_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)	> **CylModeDecel * PairCylModeDecel**				
			AND Above TRUE for))	> 80 engine cycles out of 100 engine cycles				
			BANK MISFIRE					
			Cylinders above Bank Thresholds	>= 3 cylinders				
			(Medres_Decel	> **RufSCD_Decel** * **Bank_SCD_Decel**				
			AND Medres_Jerk)	> **RufSCD_Jerk** * **Bank_SCD_Jerk**				
			OR (Medres_Decel	> **SCD_Decel** * **Bank_SCD_Decel**				
			AND Medres_Jerk)	> **SCD_Jerk** * **Bank_SCD_Jerk**				
			OR (Lores_Decel	> **RufCyl_Decel** * **BankCylModeDecel**				
			AND Lores_Jerk)	> **RufCyl_Jerk** * **BankCylModeJerk**				
			OR (Lores_Decel	> **CylModeDecel** * **BankCylModeDecel**				
			AND Lores_Jerk)	> **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)	> **RufSCD_Decel** * **ConsecSCD_Decel** > **RufSCD_Jerk** * **ConsecSCD_Jerk** > **SCD_Decel** * **ConsecSCD_Decel** > **SCD_Jerk** * **ConsecSCD_Jerk** > **RufCyl_Decel** * **ConsecCylModDecel** > **RufCyl_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.
			CYLINDER DEACTIVATION MODE (Active Fuel Managment)					
			AFM: SINGLE CYLINDER CONTINUOUS MISFIRE					
			(CylAfterDeacCyl_Decel	> **CylModeDecel** * **ClyAfterAFM_Decel**				
			AND					
			CylAfterDeacCyl_Jerk)	> **CylModeJerk** * **CylAfterAFM_Jerk**				
			OR					
			(CylBeforeDeacCylDecel	> **CylModeDecel** * **CylBeforeAFM_Decel**				
			AND					
			CylBeforeDeacCyl_Jerk)	> **CylModeJerk** * **ClyBeforeAFM_Jerk**				
			OR IF option IMEP_ AFM is Enabled	Enabled				
			IMEP	< **MisfireIMEP_Level**				
			AFM: RANDOM MISFIRE Use random misfire thresholds If no misfire for	> 6 Engine Cycles				
			(CylAfterDeacCyl_Decel	> **CylModeDecel** * **ClyAfterAFM_Decel** * **RandomAFM_Decl**				
			AND					
			CylAfterDeacCyl_Jerk)	> **CylModeJerk** * **CylAfterAFM_Jerk** * **RandomAFM_Jerk**				
			(CylBeforeDeacCylDecel	> **CylModeDecel** *				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND CylBeforeDeacCyl_Jerk)	**CylBeforeAFM_Decel** * **RandomAFM_Decl** > **CylModeJerk** * **ClyBeforeAFM_Jerk** * **RandomAFM_Jerk**				
			OR IF option IMEP_ AFM is Enabled IMEP	Enabled < **MisfireIMEP_Level** - see details on Supporting Tables Tab				
			Misfire Percent Emission Failure Threshold	≥ 2.33 % 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	> 1,463 rpm AND > 16 % load AND < 180 counts on one cylinder		
			When engine speed and load are less than the FTP cals (3) catalyst damage exceedences are allowed.	≤ 1,513 FTP rpm AND ≤ 16 FTP % load				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Engine Speed	500 < rpm < ((Engine Over Speed Limit) - 400) OR 8,191) Engine speed limit is a function of inputs like Gear and temperature see **EngineOverSpeedLimit** in supporting tables	4 cycle delay	
					No active DTCs:	TPS_FA EnginePowerLimited MAF_SensorTFTKO MAP_SensorTFTKO IAT_SensorTFTKO ECT_Sensor_Ckt_TFTKO 5VoltReferenceB_FA CrankSensor_TFTKO CrankSensor_FA CamLctnIntFA CamLctnExhFA CamSensorAnyLctnTFTKO AnyCamPhaser_FA AnyCamPhaser_TFTKO AmbPresDfltdStatus	4 cycle delay	
					P0315 & engine speed	> 1,000 rpm	4 cycle delay	
					Fuel Level Low	LowFuelConditionDiagnostic	500 cycle delay	
					Cam and Crank Sensors	in sync with each other	4 cycle delay	
					Misfire requests TCC unlock	Not honored because Transmission in hot mode or POPD intrusive	4 cycle delay	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						diagnostic running		
					Fuel System Status	≠ Fuel Cut	4 cycle delay	
					Active FuelManagement	Transition in progress	4 cycle delay	
					Undetectable engine speed and engine load region	***Undetectable region*** from Malfunction Criteria	4 cycle delay	
					Abusive Engine Over Speed	> 8,192 rpm	0 cycle delay	
					Below zero torque (except CARB approved 3000 rpm to redline triangle.)	< **ZeroTorqueEngLoad** or <**ZeroTorqueAFM** if AFM is active in Supporting Tables	4 cycle delay	
					Below zero torque: TPS Vehicle Speed	≤ 1.3 % (≤ 1.3 % in AFM) > 30 mph (> 30 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	0 cycle delay	
					Manual Trans	Clutch shift	0 cycle delay	
					Accel Pedal Position	> 98.00 %	7 cycle delay	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					AND Automatic transmission shift			
					After Fuel resumes on Automatic shift containing Fuel Cut		2 Cylinder delay	
					Delay if PTO engaged	Enabled	4 cycle delay	
					******************************	******************************	*******************	
					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		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						misfire in Supporting Tables tab		
					ABNORMAL ENGINE SPEED OSCILLATION: (checks each "misfire" candidate in 100 engine Cycle test to see if it looks like some disturbance like rough road (abnormal).)			
					Used Off Idle, and while not shifting,			
					TPS	> 3 %		
					Engine Speed	> 1,000 rpm		
					Veh Speed	> 3 mph		
					Auto Transmission	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	> **Abnormal SCD Mode**		
					Cyl Mode	> **Abnormal Cyl Mode**		
					Rev 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	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					MISFIRE CRANKSHAFT PATTERN RECOGNITION checks each "misfire" candidate in 100 engine Cycle test to see if overall crankshaft pattern looks like real misfire (recognized), or some disturbance like rough road (unrecognized). At the end of 100 engine cycle test, the ratio of unrecog/recognized is checked to confirm if real misfire is present within the 100 engine cycles. Typically used for checking a single misfire per engine cycle but can support some other patterns on some packages			
					Pattern Recog Enabled:	Enabled		
					Pattern Recog Enabled during Cylinder Deac	Not Enabled		
					Pattern Recog Enabled consecutive cyl pattrn	Enabled		
					Engine Speed	900 < rpm < 6,500		
					Veh Speed	> 3.1 mph		
					The 1st check for			

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					misfire to start check of crankshaft snap "misfire" recognized if: Crankshaft snap after: isolated "misfire" repetative "misfire" At the end of 100 engine 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 (Wheel speed noise OR ABS = OR Traction = OR Vehicle Stability) = AND No Emission Neutral Default Action DTCs	< Misfire_Jerk ***** **SnapDecayAfterMisfire** < Misfire_Jerk * **SnapDecayAfterMisfire *** **RepetSnapDecayAdjst** in Supporting Tables > 0.80 ***************************** Disabled TOSS ***************************** > **WSSRoughRoadThres** active active active ABS Failed Vehicle Dynamics Control System Status	discard 100 engine cycle test ****************** ****************** discard 100 engine cycle test	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						Driven Wheel Rotation Status Non Driven Wheel Rotation Status		
					******************************	******************************	*******************	
					IF Rough Road Source = "FromABS" (RoughRoad = OR ABS = OR Traction = OR Vehicle Stability) = AND No Emission Neutral Default Action DTCs	 detected active active active ABS Failed Vehicle Dynamics Control System Status	 discard 100 engine cycle test	
					******************************	******************************	*******************	
					IF Rough Road Source = "TOSS" TOSS dispersion AND No Active DTCs	>**TOSSRoughRoadThres** in supporting tables Transmission Output Shaft Angular Velocity Validity TransmissionEngagedState_FA (Auto Trans only) ClutchPstnSnsr FA (Manual Trans only)	discard 100 engine cycle test 4 cycle delay	
					******************************	******************************	*******************	
					Default Action Isolator Resonance Default Action Option	 Not Enabled		
					******************************	******************************	*******************	
					If Isolator Resonance	Set engine speed limits:		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Option Enabled AND Misfire P030x TFTKO	0 < Eng RPM < 8,000		

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 ≥ 0.0 seconds ≥ 400 RPM AND ≤ 8,500 RPM ≥ 0 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C ≥ 400 revs	First Order Lag Filters with Weight Coefficient = 0.0400 Updated each engine event	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit Bank 1	P0325	This diagnostic checks for an open in the knock sensor circuit Sensor 1/Bank 1. There are two possible methods used: 1. **20 kHz Method**: This method injects a 20 kHz signal (internal to the ECU) onto one of the Knock Sensor inputs. For a normal/ good circuit the 20 kHz signal will propogate through the Knock sensor and back to the ECU through the sensor return circuit. The 20 kHz signal is processed through the Fast Fourier Transform (FFT) and then filtered with a first-order lag filter. Since the Knock Detection algorithm uses a Differential Op-Amp to compare the input from the two knock sensor wires, the FFT 20 kHz diagnostic signal will have either: A. Low output with a good circuit (because the 20 kHz injected signal is detected on both of the sensor inputs) or B, High output for an Open Circuit (because	Open Circuit Method chosen (2 possible methods: 20 kHz or Normal Noise): Filtered FFT Output Filtered FFT Output	= **P0325_P0330_OpenMethod_2** **Case 1 (20 kHz Method):** **> P0325_P0330_OpenCktThrshMin (20 kHz) AND < P0325_P0330_OpenCktThrshMax (20 kHz)** **Case 2 (Normal Noise Method):** **> P0325_P0330_OpenCktThrshMin (Normal Noise) AND < P0325_P0330_OpenCktThrshMax (Normal Noise)**	Diagnostic Enabled? Engine Run Time Engine Speed Cumulative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature	Yes ≥ 0.0 seconds ≥ 650 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 A, 1 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Performance Bank 1	P0326	This diagnostic checks for knock sensor performance out of the normal expected range, on a per sensor basis. This diagnostic is specifically designed to identify the fault condition where the knock sensor is properly attached electrically, but produces an abnormally low output due to being unattached (or loosely attached) with the mounting bolt (and thus unable to properly transfer the engine vibration energy from the engine block to the knock sensor). The term "Abnormal (engine) Noise" is used to define this diagnostic method. A fault condition is identified when a first-order lag filtered version of the Abnormal Noise signal falls below the diagnostic threshold.	Filtered FFT Intensity (where 'FFT Intensity' = Non-knocking, background engine noise for a selected frequency) Filtered FFT Intensity	<u>Case 1</u>**: Engine** <u>**not**</u> **in AFM mode** < **P0326_P0331_AbnormalNoise_Threshold** (Supporting Table) OR <u>Case 2</u>**: Engine** <u>**is**</u> **in AFM mode** < **P0326_P0331_AbnormalNoise_Thresh_AFM** (Supporting Table; Engine <u>is</u> 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 ≥ 0.0 seconds ≥ 2,100 RPM (not in AFM mode) OR ≥ 8,500 (in AFM mode) AND ≤ 8,500 RPM ≥ 0 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C **P0326_P0331_AbnormalNoise_CylsEnabled** (Supporting Table) ≥ 422 Revs	First Order Lag Filters with Weight Coefficient = 0.0037 Updated each engine event	Type A, 1 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Circuit Bank 2	P0330	This diagnostic checks for an open in the knock sensor circuit Sensor 2/Bank 2 There are two possible methods used: 1. **20 kHz Method**: This method injects a 20 kHz signal (internal to the ECU) onto one of the Knock Sensor inputs. For a normal/ good circuit the 20 kHz signal will propogate through the Knock sensor and back to the ECU through the sensor return circuit. The 20 kHz signal is processed through the Fast Fourier Transform (FFT) and then filtered with a first-order lag filter. Since the Knock Detection algorithm uses a Differential Op-Amp to compare the input from the two knock sensor wires, the FFT 20 kHz diagnostic signal will have either: A. Low output with a good circuit (because the 20 kHz injected signal is detected on both of the sensor inputs) or B, High output for an	**Open Circuit Method chosen** (2 possible methods: 20 kHz or Normal Noise): Filtered FFT Output Filtered FFT Output	= **P0325_P0330_OpenMethod_2** (supporting table) **<u>Case 1 (20 kHz Method):</u>** **> P0325_P0330_OpenCktThrshMin (20 kHz)** **AND** **< P0325_P0330_OpenCktThrshMax (20 kHz)** **<u>Case 2 (Normal Noise Method):</u>** **> P0325_P0330_OpenCktThrshMin (Normal Noise)** **AND** **< P0325_P0330_OpenCktThrshMax (Normal Noise)**	Diagnostic Enabled? Engine Run Time Engine Speed Cumlative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature	Yes ≥ 0.0 seconds ≥ 650 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 A, 1 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Knock Sensor (KS) Performance Bank 2	P0331	This diagnostic checks for knock sensor performance out of the normal expected range, on a per sensor basis. This diagnostic is specifically designed to identify the fault condition where the knock sensor is properly attached electrically, but produces an Abnormally low output due to being unattached (or loosely attached) with the the mounting bolt (and thus unable to properly transfer the engine vibration energy from the engine block to the knock sensor). The term "Abnormal (engine) Noise" is used to define this diagnostic method. A fault condition is identified when a first-order lag filtered version of the Abnormal Noise signal falls below the diagnostic threshold.	Filtered FFT Intensity (where 'FFT Intensity' = Non-knocking, background engine noise) Filtered FFT Intensity	**Case 1: Engine <u>not</u> in AFM mode** < **P0326_P0331_AbnormalNoise_Threshold** (Supporting Table) OR **Case 2: Engine <u>is</u> in AFM mode** < **P0326_P0331_AbnormalNoise_Thresh_AFM** (Supporting Table)	Diagnostic Enabled? Engine Run Time Engine Speed Engine Air Flow Engine Coolant Temperature or OBD Coolant Enable Criteria Inlet Air Temperature Individual Cylinders enabled for Abnormal Noise Cumlative Number of Engine Revs Above Min Eng Speed (per key cycle)	Yes ≥ 0.0 seconds ≥ 2,100 RPM (not in AFM mode) OR > 8,500 (in AFM mode) AND ≤ 8,500 RPM ≥ 0 mg/cylinder AND ≤ 2,000 mg/cylinder ≥ -40 deg's C = TRUE ≥ -40 deg's C **P0326_P0331_AbnormalNoise_CylsEnabled** (Supporting Table) ≥ 422 Revs	First Order Lag Filters with Weight Coefficient = 0.0037 Updated each engine event	Type A, 1 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position (CKP) Sensor A Circuit	P0335	Diagnostic will fail if a crank sensor pulse was not received during a period of time; if crank sensor pulses are received the diagnostic will pass.	Time since last crankshaft position sensor pulse received	>= 4.0 seconds	Starter engaged AND (cam pulses being received OR (MAF_SensorFA AND Engine Air Flow	 = FALSE > 3.0 grams/second))	Continuous every 100 msec	Type A, 1 Trips
			No crankshaft pulses received	>= 1.0 seconds	Engine is Running Starter is not engaged		Continuous every 12.5 msec	
			No crankshaft pulses received		Engine is Running OR Starter is engaged No DTC Active:	 P0365 P0366	2 failures out of 10 samples One sample per engine revolution	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankshaft Position (CKP) Sensor A Performance	P0336	1. Fail counts will occur if the engine goes out of synchronization repeatedly over a period of time and will pass if the engine stays in synchronization. 2. Diagnostic will fail if synchronization gap is not found in a specified period of time and will pass if the synchronization gap is found. 3. Diagnostic will fail if the incorrect number of crank sensor teeth are detected in-between detecting the synchronization gap and will pass if the correct number of teeth are seen.	Time in which 10 or more crank re-synchronizations occur	< 10.0 seconds	Engine Air Flow Cam-based engine speed No DTC Active:	>= 3.0 grams/second > 450 RPM P0335	Continuous every 250 msec	Type A, 1 Trips
			No crankshaft synchronization gap found	>= 0.4 seconds	Engine is Running Starter is not engaged		Continuous every 12.5 msec	
			Time since starter engaged without detecting crankshaft synchronization gap	>= 1.5 seconds	Starter engaged AND (cam pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	
			Crank pulses received in one engine revolution OR Crank pulses received in one engine revolution	< 1 > 65,535	Engine is Running OR Starter is engaged No DTC Active:	P0365 P0366	8 failures out of 10 samples One sample per engine revolution	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A	P0340	Diagnostic will fail if a cam sensor pulse was not received during a period of time; if cam sensor pulses are received the diagnostic will pass.	Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse	>= 5.5 seconds >= 4.0 seconds	Starter engaged AND (crank pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	Type A, 1 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)	< 3 > 10	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 A, 1 Trips
			The number of camshaft pulses received during 100 engine cycles OR	< 398 > 402	Crankshaft is synchronized No DTC Active:	CrankSensor_FA	8 failures out of 10 samples Continuous every engine cycle	

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #1 CIRCUIT	P0351	Diagnoses Cylinder #1 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	 ≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 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.	$\geq$ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #3 CIRCUIT	P0353	Diagnoses Cylinder #3 Ignition Control (EST) output driver circuit for an Open Circuit fault. Controller specific output driver circuit diagnoses the low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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.	≥ 30 kΩ impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor B	P0365	Diagnostic will fail if a cam sensor pulse was not received during a period of time; if cam sensor pulses are received the diagnostic will pass.	Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse	>= 5.5 seconds >= 4.0 seconds	Starter engaged AND (crank pulses being received OR (MAF_SensorFA AND Engine Air Flow	= FALSE > 3.0 grams/second))	Continuous every 100 msec	Type A, 1 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)	< 3 > 10	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 A, 1 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.
Cold Start Camshaft Profile System Performance	P037C	3 Step Sliding Cam Cold Start Performance. When Cold Start Emissons Reduction is active, verifies that commanded 3 Step Sliding Cam desired state has been obtained	When Cold Start Emissons Reduction is active, the current commanded 3 Step Sliding Cam desired state is compared to the desired coldstart emissions reduction sliding cam state to determine if desired position has been obtained	Measured system state (High Lift or Low Lift)	Catalyst Warmup Enabled Fuel delivery mode CLO Lift Position Desired System Voltage Engine Running	= TRUE = Multi Pulse = TRUE > 11.00 Volts = TRUE	100.00 cylinder events out of 120.00 with incorrect system lift state	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 3 Control Circuit Open	P03EC	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 3 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 3 Control Circuit Low Voltage	P03ED	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 3 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 3 Control Circuit High Voltage	P03EE	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 3 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 3 Performance	P03EF	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile 3	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 3 Pin Stuck	P03F0	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 3 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 3 Circuit Open	P03F1	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 3 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 3 Circuit Low Voltage	P03F2	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 3 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 3 Circuit High Voltage	P03F3	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 3 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 3 Performance	P03F4	An Uninteded pin firing wlithout controller command. Exhaust Camshaft Profile Actuator 3	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 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)	< 0.35	All enable criteria associated with P0420 can be found under P2270 - (O2 Sensor Signal Stuck Lean Bank 1 Sensor 2) Rapid Step Response (RSR) feature will initiate multiple tests: If the difference between current EWMA value and the current OSC Normalized Ratio value is and the current OSC Normalized Ratio value is Maximum number of RSR tests to detect failure when RSR is enabled. MAF Predicted catalyst temperature Front O2 Sensor or Front WRAF Rear O2 Sensor General Enable Criteria In addition to the p-codes listed under P2270, the following DTC's shall also	> 0.61 < 0.10 6 > 2.00 g/s < 20.00 g/s < 900 ° C > 825.00 mV or > 1.08 EQR > 825.00 mV	1 test attempted per valid decel period Minimum of 1 test per trip Maximum of 3 tests per trip Frequency: Fueling Related : 12.5 ms OSC Measurements: 100 ms Temp Prediction: 12.5ms	Type A, 1 Trips

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

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.
Evaporative Emission (EVAP) System Small Leak Detected (No ELCP - Conventional EVAP Diagnostic - with EAT using OAT Sensor - with Fuel Tank Zome Module (FTZM))	P0442	This DTC will detect a small leak (≥ 0.020”) in the EVAP system between the fuel fill cap and the purge solenoid. On some applications a small leak is defined as ≥ 0.025”, 0.030”, or 0.150”. The engine off natural vacuum method (EONV) is used. EONV is an evaporative system leak detection diagnostic that runs when the vehicle is shut off when enable conditions are met. Prior to sealing the system and performing the diagnostic, the fuel volatility is analyzed. In an open system (Canister Vent Solenoid [CVS] open) high volatility fuel creates enough flow to generate a measurable pressure differential relative to atmospheric.After the volatility check, the vent solenoid will close. After the vent is closed, typically a build up of pressure from the hot soak begins (phase-1). The pressure typically will peak and then begin to decrease as the fuel cools. When	The total delta from peak pressure to peak vacuum during the test is normalized against a calibration pressure threshold table that is based upon fuel level and ambient temperature. (Please see **P0442 EONV Pressure Threshold (Pascals)** in Supporting Tables). The normalized value is calculated by the following equation: 1 - (peak pressure - peak vacuum) / pressure threshold. The normalized value is entered into EWMA (with 0= perfect pass and 1= perfect fail). When EWMA is the DTC light is illuminated. The DTC light can be turned off if the EWMA is and stays below the EWMA fail threshold for 3 additional consecutive trips.	> 0.59 (EWMA Fail Threshold), ≤ 0.35 (EWMA Re-Pass Threshold)	Fuel Level Drive Time Drive length (ECT OR OBD Coolant Enable Criteria Baro Distance since assembly plant Engine not run time before key off must be Time since last complete test if normalized result and EWMA is passing OR Time since last complete test if normalized result or EWMA is failing Estimated Ambient Temperature (EAT) using OAT sensor at end of drive Conditions for Estimated Ambient Temperature Using OAT Sensor to be	10 % ≤ Percent ≤ 90 % ≥ 600 seconds ≥ 5.0 miles ≥ 63 °C = TRUE) ≥ 70 kPa ≥ 10.0 miles ≤ refer to **P0442 Engine Off Time Before Vehicle Off Maximum as a Function of Estimated Ambient Temperature** in Supporting Tables. ≥ 8 hours ≥ 8 hours 0 °C≤Temperature≤ 35 °C	Once per trip, during hot soak (up to 2,400 sec.). No more than 2 unsuccessful attempts between completed tests.	Type A, 1 Trips EWMA Average run length is 8 to 12 trips under normal conditions Run length is 3 to 6 trips after code clear or non-volatile reset

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the pressure drops (-62) Pa from peak pressure, the vent is then opened for 60 seconds to normalize the system pressure. The vent is again closed to begin the vacuum portion of the test (phase-2). As the fuel temperature continues to fall, a vacuum will begin forming. The vacuum will continue until it reaches a vacuum peak. When the pressure rises 62 Pa from vacuum peak, the test then completes. If the key is turned on while the diagnostic test is in progress, the test will abort.			Valid			
					*****************************	*****************************		
					1. Startup OAT is less than previous trip EAT			
					OR 2. Startup ECT - previous trip EAT	≤ 0 °C		
					OR 3. Engine off time	≥ 3,600 seconds		
					OR 4. At startup, time since previous EAT valid and able to learn	≤ 3,600 seconds		
					OR 5. EAT - current OAT	0 °C ≤ difference ≤ 2 °C		
					OR 6. EAT < current OAT and speed timer	≥ 240 seconds		
					and current OAT - EAT	≤ 2 °C		
					Speed timer increments at 100 msec rate and increments vary based on vehicle speed as follows:			
					vehicle speed < 10 mph	- 0.2 seconds		
					10 mph<speed< 35 mph	0.10 seconds		
					35 mph<speed< 124	0.33 seconds		
					124 mph<speed< 124	0.33 seconds		
					Speed timer can never be less than 0 seconds			
					*****************************	*****************************		
					1. High Fuel Volatility			
					During the volatility			

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0498 P0499 P0496 P1001 P1005 P11FF P130F U18A2		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Circuit (ODM) (No ELCP - Conventional EVAP Diagnostic)	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 output and controller ground.	Powertrain relay voltage	Voltage ≥ 11.0 volts	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0458 may also set (Canister Purge Solenoid Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) Vent System Performance (No ELCP - Conventional EVAP Diagnostic - with purge pump - with Fuel Tank Zone Module (FTZM))	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister. This diagnostic runs with normal purge control and canister vent solenoid commanded open. The diagnostic fails when the FTP sensor vacuum measurement is above a vacuum threshold before it accumulates purge volume above a threshold. The diagnostic passes when it accumulates purge volume above a threshold before the FTP sensor vacuum measurement is above a vacuum threshold.	Vent Restriction Prep Test: Vented Vacuum for OR Vented Vacuum for Vent Restriction Test: Tank Vacuum for before Purge Volume After setting the DTC for the first time, 0 liters of fuel must be consumed before setting the DTC for the second time.	 < -623 Pa 60 seconds > 1,245 Pa 60 seconds > refer to **P0446 canister vent restriction test tank vacuum threshold** in Supporting Tables. Calibration threshold (Pa) for canister vent restriction as function (baro) 5 seconds ≥ refer to **P0446 canister vent restriction test displaced purge volume limit** in Supporting Tables. Calibration threshold (liters) for canister vent restriction as function (baro)	Fuel Level System Voltage Startup IAT Startup ECT Barometric Pressure P146C EVAP Purge Pump System Misassembled diagnostic is not running No active DTCs: No Active DTC's TFTKO	10 % ≤ Percent ≤ 90 % ≥ 10.0 volts 4 °C≤Temperature≤ 35 °C ≤ 35 °C ≥ 70 kPa MAP_SensorFA TPS_FA VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault EnginePowerLimited EvapPurgeSolenoidCircuit_FA EvapVentSolenoidCircuit_FA FTP_SensorCircuit_FA PurgePumpDiag_FA LIN Communication Fault Active P0443 P0449 P0452 P0453 P0454 P0458 P0459 P0498 P0499 P1001 P1005 P11FF P130F U18A2	Once per Cold Start Time is dependent on driving conditions Maximum time before test abort is 1,400 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) Vent Solenoid Control Circuit (ODM) (No ELCP - Conventional EVAP Diagnostic - with Fuel Tank Zone Module (FTZM))	P0449	Controller specific output driver circuit diagnoses the vent solenoid low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	≥ 200 K Ω impedence between output and controller ground	No active DTCs:	P1005 P130F U18A2	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0498 may also set (Vent Solenoid Short to Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit Performance (No ELCP - Conventional EVAP Diagnostic)	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test. During the EONV test, the fuel tank vacuum sensor is re-zeroed. A re-zero occurs: 1) At the transition from the volatility phase to the pressure phase. 2) At the transition from the pressure phase to the vacuum phase. The re-zero test determines if the tank vacuum signal falls within a calibratable window about atmospheric pressure. If after some time, the tank vacuum signal does not fall to within the window, the re-zero test exits to the refueling rationality test. The refueling rationality test determines if a refueling event caused the re-zero problem. If so, the re-zero problem is ignored. If a refueling event is not	The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts) Upper voltage threshold (voltage addition above the nominal voltage) Lower voltage threshold (voltage subtraction below the nominal voltage) The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with a EWMA (with 0= perfect pass and 1=perfect fail). When EWMA is the DTC light is illuminated. The DTC light can be turned off if the EWMA is and stays below the EWMA fail threshold for 3 additional consecutive trips.	0.2 volts 0.2 volts > 0.73 (EWMA Fail Threshold), ≤ 0.40 (EWMA Re-Pass Threshold)	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes		This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period.The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.	Type A, 1 Trips EWMA Average run length: 6 Run length is 2 trips after code clear or non-volatile reset

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage (No ELCP - Conventional EVAP Diagnostic - with Fuel Tank Zone Module (FTZM))	P0452	This DTC will detect a Fuel Tank Pressure (FTP) sensor signal that is too low out of range. The FTP sensor circuit out of range diagnostic compares the raw sensor voltage to a lower voltage threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the sensor voltage is below the lower voltage threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported for P0452 DTC. A pass is reported for P0452 DTC if the low sample counter reaches its threshold.	FTP sensor signal The normal operating range of the FTP sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~ -3736 Pa).	< 0.15 volts (3.0 % of Vref or ~ 1,495 Pa)	No active DTC's:	P1001 P1005 U18A2	640 failures out of 800 samples 12.5 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit High Voltage (No ELCP - Conventional EVAP Diagnostic - with Fuel Tank Zone Module (FTZM))	P0453	This DTC will detect a Fuel Tank Pressure (FTP) sensor signal that is too high out of range. The FTP sensor circuit out of range diagnostic compares the raw sensor voltage to an upper voltage threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the sensor voltage is above the upper voltage threshold, the high fail counter then increments. If the high fail counter reaches its threshold then a fail is reported for P0453 DTC. A pass is reported for P0453 DTC if the high sample counter reaches its threshold.	FTP sensor signal The normal operating range of the FTP sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~ -3736 Pa).	> 4.85 volts (97.0 % of Vref or ~ -3,985 Pa)	No active DTCs:	P1001 P1005 U18A2	640 failures out of 800 samples 12.5 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Tank Pressure (FTP) Sensor Circuit Intermittent (No ELCP - Conventional EVAP Diagnostic)	P0454	This DTC will detect intermittent tank vacuum sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event. During the EONV test, an abrupt change in fuel tank vacuum is identified as a possible refueling event. If the abrupt change occurs while the vent valve is closed, the EONV small-leak test aborts and the refueling rationality test starts. If the refueling rationality test detects a refueling event, then the vacuum change is considered “rational.” If the refueling rationality test does not detect a refueling event, then the vacuum change is considered “irrational.” The vacuum change rationality diagnostic is an “X out of Y” test. 1) Each time the EONV test completes, the (Y) sample counter is incremented. 2) Each time the	If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem. An abrupt change is defined as a change in vacuum in the span of 1.0 seconds. But in 12.5 msec. A refueling event is confirmed if the fuel level has a persistent change of for 30 seconds during a 600 second refueling rationality test.	> 112 Pa < 249 Pa > 10 %	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes and the canister vent solenoid is closed		This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period.The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.The test will report a failure if 2 out of 3 samples are failures. 12.5 ms / sample	Type A, 1 Trips

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) System Large Leak Detected (No ELCP - Conventional EVAP Diagnostic - with Purge Pump - with Fuel Tank Zone Module (FTZM))	P0455	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the EVAP system. This mode checks for large leaks and blockages when proper driving conditions are met. If these conditions are met, the diagnostic commands the vent valve closed and controls the purge duty cycle to allow purge flow to purge the fuel tank and canister system while monitoring the fuel tank vacuum level. The algorithm accumulates purge flow during the test to determine a displaced purge volume as the test proceeds. If the displaced purge volume reaches a threshold before the fuel tank vacuum level reaches its passing threshold, then a large leak failure is detected. On fuel systems with fuel caps If the first failure of	Purge volume while Tank vacuum After setting the DTC for the first time, 0 liters of fuel must be consumed before setting the DTC for the second time.	> refer to **P0455 large leak diagnostic displaced purge volume threshold** in Supporting Tables. Calibration threshold (liters) for large leak diagnostic as function of barometric pressure (kPa) ≤ refer to **P0455 large leak diagnostic tank vacuum threshold** in Supporting Tables. Calibration threshold (Pa) for large leak diagnostic as function of barometric pressure (kPa)	Fuel Level System Voltage Barometric Pressure Purge Flow No active DTCs: No Active DTC's TFTKO If ECT > IAT, Startup temperature delta (ECT-IAT): Startup IAT Startup ECT	10 % ≤ Percent ≤ 90 % ≥ 10.0 volts ≥ 70 kPa ≥ 2.00 % MAP_SensorFA TPS_FA VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault EnginePowerLimited EvapPurgeSolenoidCircuit_FA EvapVentSolenoidCircuit_FA FTP_SensorCircuit_FA PurgePumpDiag_FA LIN Communication Fault Active P0443 P0449 P0452 P0453 P0454 P0458 P0459 P0498 P0499 P1001 P1005 P11FF P130F U18A2 ≤ 8 °C 4 °C≤Temperature≤ 35 °C ≤ 35 °C	Once per cold start Time is dependent on driving conditions Maximum time before test abort is 1,400 seconds Weak Vacuum Follow-up Test With large leak detected, the follow-up test is limited to 0 seconds. Once the MIL is on, the follow-up test runs indefinitely.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		P0455 occurred after a refueling event was detected and the MIL is off for P0455, the MIL will be commanded off after the first pass of P0455 is reported. If the first failure of P0455 did not occur after a refueling event was detected, the MIL will be commanded off on the ignition cycle after the third consecutive pass of P0455 is reported.the MIL will be commanded off on the ignition cycle after the third consecutive pass of P0455 is reported. On fuel systems without fuel caps The P0455 MIL will be commanded off on the ignition cycle after the third consecutive pass of P0455 is reported.	Weak Vacuum Follow-up Test (fuel cap replacement test) Weak Vacuum Test failed. Passes if tank vacuum Note: Weak Vacuum Follow-up Test can only report a pass.	≥ 2,740 Pa	Weak Vacuum Follow-up Test This test can run following a weak vacuum failure or on a hot restart.			

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Purge Control Valve Circuit High (No ELCP - Conventional EVAP Diagnostic)	P0459	Controller specific output driver circuit diagnoses the canister purge solenoid low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 0.5 Ω impedence between output 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 primary fuel tank level sensor stuck in-range.	a) Sensed fuel volume change is b) while engine fuel consumption is	a) < 3 liters b) >= 27.81 liters	1. Diagnostic Enabled 2. Engine Operational State	1. == True 2. == Running	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 primary fuel tank sensor stuck out-of-range low.	Fuel level Sender % of 5V range	< 10 % or 85.08 liters	a) Diagnostic enabled status b) Fuel Level Sensor Initialized status c) Fuel Level Sensor Data Available Status d) Communication faults status	a) == True b) == True c) == True d) <> True	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 primary fuel tank level sensor stuck out-of-range high.	Fuel level Sender % of 5V range	> 60 % or 4.78 liters	a) Diagnostic enabled status b) Fuel Level Sensor Initialized status c) Fuel Level Sensor Data Available Status d) Communication faults status	a) == True b) == True c) == True d) <> True	100 failures out of 125 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 1 Circuit Intermittent (No ELCP - Conventional EVAP Diagnostic)	P0464	This DTC will detect intermittent fuel level sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event. During the EONV test, a change in fuel level is identified as a possible refueling event. If the change occurs while the vent valve is closed, the EONV small-leak test aborts and the refueling rationality test starts. If the refueling rationality test detects a refueling event, the fuel level change is considered “rational.” If the refueling rationality test does not detect refueling, the fuel level change is considered “irrational.” The fuel level change rationality diagnostic is an “X out of Y” test. 1) Each time the EONV test completes, the (Y) sample counter is incremented. 2) Each time the rationality test has an	If a change in fuel level is detected, the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that an actual refueling event occurred. If a refueling event is confirmed, then the test sample is considered passing. Otherwise, if a refueilng event is not confirmed, then the test sample is considered failing which indicates an intermittent signal problem. An intermittent fuel level signal problem is defined as: The fuel level changes by and does not remain for 30 seconds during a 600 second refueling rationality test.	 > 10 % > 10 %	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes		This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period.The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete.The test will report a failure if 2 out of 3 samples are failures. 100 ms / sample	Type A, 1 Trips

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 1 Relay Control Circuit Open (Output Driver Monitor) (Not used on EREV/ PHEV/ HEV)	P0480	Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults	Voltage low during driver off state (indicates open circuit)	Open Circuit: ≥ 200 K Ω impedance between signal and controller ground	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P0691 may also set (Fan 1 Short to Ground).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) System Flow During Non-Purge (No ELCP - Conventional EVAP Diagnostic - with purge pump - with Fuel Tank Zone Module (FTZM))	P0496	This DTC will determine if the purge valve solenoid is leaking into the induction system or is leaking between the purge pump and purge valve solenoid. It does this by sealing the EVAP system (purge and vent valve closed) and then monitors fuel tank vacuum level. The fuel tank vacuum level should not increase. If tank vacuum increases above a threshold, a malfunction is indicated. Additional Information The purge valve leak diagnostic exists to helps service replace leaking purge valves that could otherwise be detected with the EONV small leak diagnostic (P0442).	Tank Vacuum for Test time	> refer to **P0496 purge valve leak diagnostic vacuum threshold** in Supporting Tables. Calibration threshold (Pa) for purge valve leak diagnostic as func (baro) as a function of barometric pressure (kPa) 5 seconds ≤ refer to **P0496 purge valve leak test time as a function of fuel level and barometric pressure** in Supporting Tables. Test time only increments when engine vacuum ≥ 10.0 kPa.	Fuel Level System Voltage Barometric pressure Startup IAT Startup ECT Engine Off Time Initial purge pump pressure P146C EVAP Purge Pump System Misassembled diagnostic is not running Purge pump over tempertaure status is False No active DTCs: No pending DTCs: No Active DTC's TFTKO	10 % ≤ Percent ≤ 90 % ≥ 10.0 volts ≥ 70 kPa 4 °C≤Temperature≤ 35 °C ≤ 35 °C ≥ 28,800.0 seconds ≥ 3.1 kPa MAP_SensorFA TPS_FA VehicleSpeedSensor_FA IAT_SensorFA ECT_Sensor_FA AmbientAirDefault EnginePowerLimited EvapPurgeSolenoidCircuit_FA EvapVentSolenoidCircuit_FA FTP_SensorCircuit_FA PurgePumpDiag_FA LIN Communication Fault Active LIN Communication Fault Pending P0443 P0449	Once per cold start Cold start: max time is 1,400 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0452 P0453 P0454 P0458 P0459 P0498 P0499 P1001 P1005 P11FF P130F U18A2		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Vent Solenoid Control Circuit Low (No ELCP - Conventional EVAP Diagnostic - with Fuel Tank Zone Module (FTZM))	P0498	Controller specific output driver circuit diagnoses the vent solenoid low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	 ≤ 0.5 Ω impedence between output and controller ground	No active DTC's:	P1005 P130F U18A2	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips Note: In certain controllers P0449 may also set (Vent Solenoid Open Circuit)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission System Vent Solenoid Control Circuit High (No ELCP - Conventional EVAP Diagnostic - with Fuel Tank Zone Module (FTZM))	P0499	Controller specific output driver circuit diagnoses the vent solenoid low sided driver for a short to power failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds. If the P0499 is active, an intrusive test is performed with the vent solenoid commanded closed for 15 seconds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	$\leq$ 0.5 Ω impedence between output and controller power	No active DTC's:	P1005 P130F U18A2	20 failures out of 25 samples 250 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Low Engine Speed Idle System	P0506	This DTC indicates that actual engine speed is lower than desired engine speed at idle so that it is out of speed control capability. Testing is performed when basic conditions are met. If filtered engine speed error exceeds a calibrated threshold for a calibrated duration, code is set. This testing is performed continuously per trip if basic conditions are met	Filtered Engine Speed Error. It is calculated with a calibrated filter coefficient	> 75.00 rpm	Baro	> 70 kPa	Diagnostic runs in every 12.5 ms loop	Type B, 2 Trips
			Filter coefficient	0.00350	Coolant Temp	> 60 °C	Diagnostic reports pass or fail in 10 seconds once all enable conditions are met	
					Engine run time	≥ 30 sec		
					Ignition voltage	32 ≥ volts ≥ 11		
					Time since gear change	≥ 3 sec		
					Time since a TCC mode change	> 3 sec		
					IAT	> -20 °C		
					Vehicle speed	≤ 1.24 mph, 2kph		
					Commanded RPM delta	≤ 25 rpm		
					Idle time	> 5 sec		
					For manual transmissions: Clutch Pedal Position	> 88.00 pct		
					or Clutch Pedal Position	< 16.00 pct		
						PTO not active		
						Transfer Case not in 4WD LowState		

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
High Engine Speed Idle System	P0507	This DTC indicates that actual engine speed is higher than desired engine speed at idle so that it is out of speed control capability. Testing is performed when basic conditions are met. If filtered engine speed error exceeds a calibrated threshold for a calibrated duration, code is set. This testing is performed continuously per trip if basic conditions are met	Filtered Engine Speed Error. It is calculated with a calibrated filter coefficient	< -150.00 rpm	Baro	> 70 kPa	Diagnostic runs in every 12.5 ms loop	Type B, 2 Trips
					Coolant Temp	> 60 °C	Diagnostic reports pass or fail in 10 seconds once all enable conditions are met	
			Filter coefficient	0.00350				
					Engine run time	≥ 30 sec		
					Ignition voltage	32 ≥ volts ≥ 11		
					Time since gear change	≥ 3 sec		
					Time since a TCC mode change	> 3 sec		
					IAT	> -20 °C		
					Vehicle speed	≤ 1.24 mph, 2kph		
					Commanded RPM delta	≤ 25 rpm		
					For manual transmissions: Clutch Pedal Position	> 88.00 pct		
					or Clutch Pedal Position	< 16.00 pct		
						PTO not active		
						Transfer Case not in 4WD LowState		
						Off-vehicle device control (service bay control) must not be active.		

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Rough Idle	P050D	Monitors the combustion performance when the cold start emission reduction strategy is active by accumulating and determining the percentage of engine cycles that have less than complete combustion relative to the total number of engine cycles in which Dual Pulse is active.	Deceleration index vs. Engine Speed Vs Engine load Deceleration index calculation is tailored to specific vehicle. Tables used are 1st tables encountered that are not max of range. Undetectable region at a given speed/load point is where all tables are max of range point. Incomplete combustion identified by P0300 threshold tables:	(>Idle SCD AND >Idle SCD ddt Tables) OR (>Idle Cyl Mode AND > Idle Cyl Mode ddt Tables)	Misfire Algorithm Enabled (Refer to P0300 for Enablement Requirements) OBD Manufacturer Enable Counter To enable the diagnostic, the Cold Start Emission Reduction Strategy Must Be Active per the following: Catalyst Temperature AND Engine Coolant AND Engine Coolant AND Barometric Pressure In addition, Dual Pulse Strategy Is Enabled and Active Per the following: Engine Speed Accel Position Engine Run Time For the engine speeds and loads in which Dual Pulse is active:	= 0 < 500.00 degC > -12.00 degC <= 66.00 degC >= 72.00 KPa >= 300.00 RPM <= 2,600.00 RPM <= 1.00 Pct < 22 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	>= 800.00 degC		
					Engine Run Time	>= 22.00 seconds		
					OR			
					Engine Run Time	> **P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit** This Extended Engine run time exit table is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details.		
					OR			
					Barometric Pressure	< 72.00 KPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Dual Pulse Strategy will exit per the following:			
					Engine Speed OR	> 2,800.00 RPM		
					Accel Position	> 2.00 Pct		
					Engine Run Time	>= 22 seconds		
					Dual Pulse Strategy will also exit if the any of the "Additional Dual Pulse Enabling Criteria" is not satisfied:			
					"Additional Dual Pulse Enabling Criteria":			
					Green Engine Enrichment	Not Enabled		
					Misfire Converter Protection strategy	Not being requested		
					Engine Metal Overtemp strategy	Not being requested		
					Fuel control state	Open Loop		
					Output State Control	Not being requested for fuel		
					DOD Or DFCO	Not Active		
					Power Enrichment	Not Active		
					Dynamic Power Enrichment	Not Active		
					Piston Protection	Not Active		
					Hot Coolant Enrichment	Not Active		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure (EOP) Sensor Performance - Continuously Variable Displacement 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 running 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, High Pressure State** To Fail when previously passing with the engine running: Filtered Engine Oil Pressure below threshold OR Filtered Engine Oil Pressure above threshold To pass when previously failing: Filtered Engine Oil Pressure above low threshold plus an offset OR Filtered Engine Oil Pressure below high threshold minus an offset	Filtered Oil Pressure < (**P0521_CVDOP_MinOilPresFail** kPa) OR Filtered Oil Pressure > (**P0521_CVDOP_MaxOilPressure** kPa) Filtered Oil Pressure > (**P0521_CVDOP_MinOilPresFail** + 10.0 kPa) OR Filtered Oil Pressure < (**P0521_CVDOP_MaxOilPressure** - 10.0 kPa)	Variable Displacement 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 > 4,500 RPM for longer than **TimeForOilAeration** seconds) Filtered Engine Speed within range Oil Temperature within range Engine Speed stable No active DTC's	Enabled Enabled Test not report a fail state Yes ≥ 10.0 seconds ≥ 70.0 kPa FALSE 1,000 RPM ≤ Filtered Engine Speed ≤ 4,500 RPM 40.0 deg C ≤ Oil Temp ≤ 120.0 deg C (RPM - Previous RPM) < 35 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.
			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 ≥ 20.00 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	Enabled Enabled Test not report a fail state ≥ 60.0 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	< 10.00 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	640 failures out of 1,280 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	> 90.00 percent Deadband: < 5 percent or > 95 percent	Oil Pressure Sensor In Use Diagnostic Status	Yes Enabled	640 failures out of 1,280 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	< 3 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	> 95 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 Low	P0562	Detects a low 12V battery system. This diagnostic reports the DTC when battery voltage is low. Monitoring occurs when the engine speed is above a calibrated value.	System voltage low	Battery voltage <= 9.00	System voltage low diag enable = TRUE Run Crank voltage Engine speed >=	1.00 Voltage ≥ 5.00 volts 400.00	400 failures out of 500 samples 12.5 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.
System Voltage High	P0563	Detects a high 12V battery system. This diagnostic reports the DTC when battery voltage is high.	System voltage high	Battery voltage >= 18.00	System voltage high diag enable = TRUE Run Crank voltage	1.00 Voltage ≥ 5.00 volts	400 failures out of 500 samples 12.5 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. "Neutral Default State - When the BCM tells the ECM that the cruise control analog input voltage is in an invalid range, ECM sets the code and cruise control is disabled"	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 , "Emissions Neutral Diagnostics – 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 "Neutral Default State - When the BCM tells the ECM that the cruise control analog input voltage is in the Momentary Cruise On/ Off range for too long, the code is set and cruise control is disabled." Only applicable for vehicles with a momentary on/ off cruise switch architecture.	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 , "Emissions Neutral Diagnostics – 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 "Neutral Default State - When the BCM tells the ECM that the cruise control analog input voltage is in the Resume range for too long, the code is set and cruise control is disabled"	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 , "Emissions Neutral Diagnostics – 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 "Neutral Default State - When the BCM tells the ECM that the cruise control analog input voltage is in the Set range for too long, the code is set and cruise control is disabled"	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 , "Emissions Neutral Diagnostics – 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	Detects a failure of the cruise cancel switch in a continously applied state "Neutral Default State - When the BCM tells the ECM that the cruise control analog input voltage is in the Cancel range for too long, the code is set and cruise control is disabled"	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 , "Emissions Neutral Diagnostics – 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. "Neutral Default State - When the ECM determines that a serial communication fault from the BCM has occurred with frame $1E1, the code is set and cruise control is disabled".	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 , "Emissions Neutral Diagnostics – 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 > 3.37 OR (for slow test) shift lever has been in park once this key cycle vehicle speed >= 3.50 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 >= 3.50 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	8.24	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 "Neutral Default State - When the BCM tells the ECM that the cruise switch circuit voltage is too low for too long, the code is set and cruise is disabled." Only applicable for vehicles with a momentary on/ off cruise switch architecture.	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 , "Emissions Neutral Diagnostics – 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	detects short to power failure for cruise multi-function switch circuit "Neutral Default State - When the BCM tells the ECM that the cruise switch circuit voltage is too high for too long, the code is set and cruise is disabled." Only applicable for vehicles with a momentary on/off cruise switch architecture.	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, "Emissions Neutral Diagnostics – special type C"

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

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

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

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

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

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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. A Part 1 failure result then 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 > 99.00 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. A Part 1 failure result then 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 > 99.00 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.
Exhaust Camshaft System Cold Start Performance – Bank 1	P05CE	Detects a VVT system error during Cold Starts by comparing the desired and actual cam positions when VVT is activated. This is the same type diagnostic as P0014 except this detects excessive deviations of position while the cold start phaser positions are being commanded.	Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive	Cam Position Error > 6.00 deg.	**Exhaust Cam Phsr Enable** 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 > 6.00 deg AND < 30.00 deg < 3.00 deg for (**P0014_P05CE_StablePositionTimeEc1**) sec P0013 P2090 P2091	65 failures out of 75 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.
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.	
				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.	
			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 >	0.45384 s			When dual store updates occur.	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Indicates that the primary processor detects an illegal write attempt to protected RAM. Number of illegal writes are >	65,534 counts			Diagnostic runs continuously (background loop)	

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.	Time new seed not received exceeded			always running	0.450 seconds	Type A, 1 Trips
			MAIN processor receives seed in wrong order			always running	3 / 18 counts intermittent. 50 ms/count in the ECM main processor	
			2 fails in a row in the MAIN processor's ALU check			Test is Enabled: 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			Test is Enabled: 1 . (If 0, this test is disabled)	12.5 to 25 ms	
			Checks number of stack over/under flow since last powerup reset >=	3.00		Test is Enabled: 1 . . (If 0, this test is disabled)	variable, depends on length of time to corrupt stack	
			Voltage deviation >	0.4950		Test is Enabled: 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.	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	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Counter >=					
			Checks for ECC (error 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 >=	3 (results in MIL), 5 (results in MIL and remedial action)		KeMEMD_b_RAM_ECC_CktTestEnbl == 1 Value of KeMEMD_b_RAM_ECC_CktTestEnbl is: 1 . (If 0, this test is disabled)	variable, 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_XferTestEnbld == 1 Value of KePISD_b_DMA_XferTestEnbld is: 1 . (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.		Test is Enabled: 1 (If 0, this 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	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							the ECM main processor	
			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.
Internal ECM Processor Integrity Performance	P0607	Indicates that the ECM has detected an internal processor integrity performance.	Performs the failure diagnostic for the offline and online BIST results.			Test is Enabled: 0 . (If 0, this test is disabled)	5 counts background task/ count in the ECM main processor	Type A, 1 Trips
			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)		Test is Enabled: 1 . (If 0, this test is disabled)	variable, depends on length of time to access flash with corrupted memory	
			Checks for ECC (error 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 >=	3 (results in MIL), 5 (results in MIL and remedial action)		Test is Enabled: 1 . (If 0, this test is disabled)	variable, depends on length of time to write flash to RAMvariable, depends on length of time to write flash to RAM	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ANDR ADC Fault	P060B	Indicates that the ECM has detected an ANDR ADC Fault.	Resistance deviation percent >	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or 1.75 seconds continuous; 250 ms/count in the ECM main processor	
			Resistance deviation percent >	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or 1.75 seconds continuous; 250 ms/count in the ECM main processor	
			Resistance deviation percent >	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or 1.75 seconds continuous; 250 ms/count in the ECM main processor	
			Resistance deviation percent >	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or 1.75 seconds continuous; 250 ms/count in the ECM main processor	
			Resistance deviation percent >	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or 1.75 seconds continuous; 250 ms/count in the ECM main processor	
			Resistance deviation percent >	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or 1.75 seconds continuous; 250 ms/count in the ECM main processor	
			Resistance deviation	6.00 %	Run/Crank Voltage >	7.00 V	2 / 14 counts or	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			percent >				1.75 seconds continuous; 250 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.
Starter Relay Control Circuit Open (12VSS)	P0615	Controller specific output driver circuit diagnoses the Starter relay (12VSS) low sided driver for an open circuit failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates open circuit failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for an open circuit.	>= 200 KOhms impedance between signal and controller ground.	Starter control diag enable = TRUE Engine speed Run Crank voltage	1.00 >= 0.00 RPM >= 11.00 volts	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Control Circuit Low Voltage (12VSS)	P0616	Controller specific output driver circuit diagnoses the Starter relay (12VSS) low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver off state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	<= 0.5 Ohms impedance between signal and controller ground	Starter control diag enable = TRUE Engine speed Run Crank voltage	1.00 >= 0.00 RPM >= 6.41 volts	8 failures out of 10 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Starter Relay Control Circuit High Voltage (12VSS)	P0617	Controller specific output driver circuit diagnoses the Starter relay low sided driver for a short to power failure when the output is powered on by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	<= 0.5 Ohms impedance between signal and controller power	Starter control diag enable = TRUE Engine speed Run Crank voltage	1.00 >= 0.00 RPM >= 6.41 volts	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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.
Internal Control Module O2 Sensor Processor Performance Bank 1) (For use with WRAF	P064D	Diagnoses the WRAF Application-Specific Integrated Circuit (ASIC) for Controller Status and Measure Valid faults. These faults can impact closed loop fuel control. This DTC when enabled, monitors the two different failure counters it receives from the WRAF ASIC. The individual diagnostic failure counters are incremented based on the message received from the ASIC. The DTC is set based on any of the two individual fail and sample counters.	B1S1 WRAF ASIC indicates control module faults	Controller Status fail counts and Measure Valid fail counts are accumulated to determine fault status	Engine Run or Auto stop Heater Warm-up delay WRAF circuit diagnostic delay since power up	= True = Complete ≥ 20.0 sec	128 controller status fail counts out of 160 samples OR 128 measure valid fail counts out of 160 samples 25 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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 output 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 output 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 output 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 B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powertrain Relay Feedback Circuit High	P0690	Detects higher than expected voltage in the powertrain relay feedback circuit. This diagnostic reports the DTC when higher than expected voltage is present. For example, the powertrain relay could be stuck on. Monitoring occurs when the relay is commanded "off" for a calibrated duration.	Powertrain Relay Voltage	>= 4.00 volts will increment the fail counter	Powertrain relay commanded “OFF” 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.
Cooling Fan 1 Relay Control Circuit Low Voltage (Output Driver Monitor)	P0691	Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults	Voltage low during driver off state (indicates short-to-ground)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips Note: In certain controllers P0480 may also set (Fan 1 Open Circuit).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cooling Fan 1 Relay Control Circuit High Voltage (ODM)	P0692	Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults	Voltage high during driver on state (indicates short to power)	Short to power: ≤ 0.5 Ω impedance between signal and controller power	Powertrain Relay Voltage	Voltage ≥ 11.00 volts	50.00 failures out of 63.00 samples 100 ms / sample	Type B, 2 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Knock Sensor Processor 1 Performance	P06B6	This diagnostic checks for a fault with the internal test circuit (sensor #1) used only for the '20 kHz' method of the Open Circuit Diagnostic. A fault is present when the signal level from the 20 kHz range of the FFT output falls between the Open Test Circuit thresholds.	FFT Diagnostic Output	**> P06B6_P06B7_OpenTestCktThrshMin** **AND** **< P06B6_P06B7_OpenTestCktThrshMax** **See Supporting Tables**	Diagnostic Enabled? Engine Run Time Engine Speed Cumlative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow	Yes ≥ 0.0 seconds > 650 RPM and < 4,750 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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Knock Sensor Processor 2 Performance	P06B7	This diagnostic checks for a fault with the internal test circuit (sensor #2) used only for the '20 kHz' method of the Open Circuit Diagnostic. A fault is present when the signal level from the 20 kHz range of the FFT output falls between the Open Test Circuit thresholds.	FFT Diagnostic Output	**> P06B6_P06B7_OpenTestCktThrshMin** **AND** **< P06B6_P06B7_OpenTestCktThrshMax** **See Supporting Tables**	Diagnostic Enabled? Engine Run Time Engine Speed Cumlative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above) Engine Air Flow	Yes ≥ 0.0 seconds > 650 RPM and < 4,750 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 A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure Control Circuit/Open	P06DA	Controller specific output driver circuit diagnoses the 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 output and controller ground	Powertrain Relay Voltage Run/Crank Active Cranking State	≥ 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 (Engine Oil Pressure Control Circuit Short To Ground)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure Control Circuit Low	P06DB	Controller specific output driver circuit diagnoses the 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 output and controller ground	Powertrain Relay Voltage Run/Crank Active Cranking State	≥ 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 (Engine Oil Pressure Control Circuit Open)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure Control Circuit High	P06DC	Controller specific output driver circuit diagnoses the 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 output and controller power	Powertrain Relay Voltage Run/Crank Active Cranking State	≥ 11.00 = True = False	>= 40 errors out of 50 samples. Performed every 100 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Oil Pump Control Circuit Performance - Continuously Variable Displacement Oil Pump	P06DD	Diagnoses the oil pump is stuck in a high pressure state. The test determines if the oil pump is capable of meeting the pressure demand.	Absolute Oil Pressure Error = ABS [Desired Oil Pressure - Measured Oil Pressure] A first-order lag filter is applied to the error value, every 100ms: Filtered Pressure Error = Previous Error + 0.00400 *(New Error - Previous Error) <u>Fail from passing state:</u> Filtered Oil Pressure Error is greater than a threshold AND the cycler algorithm is unable to clear the fault. <u>Pass from failing state:</u> Filtered Oil Pressure Error is less than a threshold	Filtered Pressure Error ≥ 40.00 kPa AND Cycler Algorithm has cycled the pump solenoid for 1.80 seconds AND Filtered Pressure Error ≥ 40.00 kPa after the cycler is complete Filtered Pressure Error < 40.00 kPa	<u>Common Criteria:</u> Closed Loop Pump Control Active Engine Running Powertrain Relay Voltage Desired Oil Pressure in Range Oil Temperature in Range Engine Speed in Range	≥ 11.00 **P06DD_CVDOP_MinDesPres** ≤ Desired Oil Pressure ≤ **P06DD_CVDOP_MaxDesPress** 40.00 °C ≤ Oil Temp ≤ 120.00 °C 1,000 RPM <= Engine Speed <= 4,500	Performed every 100ms.	Type A, 1 Trips

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Traction Control Torque Request Circuit	P0856	Determines if torque request from the EBCM 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 > 261 Nm for engine torque based traction torque system, OR > 3,941 Nm for axle torque based traction torque system	Active Communication with EBCM Power Mode Engine Running Status of traction in GMLAN message ($4E9) Run/Crank Active Ignition Voltage	Received serial data = Run = True = Traction Present > 0.50 seconds > 6.41 volts	>= 6 failures out of 10 Performed on every received message 6 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 Emissions Neutral Diagnostic - Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Reset Signal Message Counter Incorrect	P1000	This DTC monitors for an error in communication with the Fuel Pump Driver Control Module Reset Signal	Communication of the Alive Rolling Count or Protection Value from the FPDCM over CAN bus is incorrect for out of total samples	 >= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage And Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Evaporative Emission (EVAP) System Signals Message Counter Incorrect	P1001	This DTC monitors for an error in communication with the Evaporative Emission (EVAP) System Signal	Communication of the Alive Rolling Count or Protection Value from the EVAP System over CAN bus is incorrect for out of total samples	 >= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage And Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module System Voltage Performance (Only on applications that use an FTZM)	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 Fuel Pump Driver Control Module System Voltage Performance diagnostic is enabled 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	 = 1	50 failures out of 63 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 Control System Signals Message Counter Incorrect	P1003	This DTC monitors for an error in communication with the Fuel Control System Signals	Communication of the Alive Rolling Count or Protection Value from the Fuel Control System over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage And Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Reset Error	P1005	This DTC monitors for a reset error in the Fuel Pump Driver Control Module	If the received value for the time since the last FPDCM reset has reset and the newly received value or previous value is for out of total samples	<= 0.50 seconds >= 2.00 counts >= 400.00 counts	DTC is enabled Sensor bus relay Battery voltage P1000 U18A2	1.00 (1 indicates enabled) On > 11.00 Volts Not active Not active	Diagnostic runs in 50 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.
Fuel Pump Driver Control Module Ignition Switch Run/ Start Position Circuit High (Only on applications that use an FTZM)	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		40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips
					Fuel Pump Driver Control Module Ignition Switch Run/Start Position Circuit High diagnostic is enabled	= 1		
					Fuel Tank Zone Module (FTZM) serial messages are available			
					Run Crank Active	= FALSE		
					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 Temperature (Fuel Tank Zone Module) Too High Signal Message Counter Incorrect	P1009	This DTC monitors for an error in communication with the Fuel Pump Driver Control Module (FTZM) Temperature Too High Signal Message	Communication of the Alive Rolling Count or Protection Value from the Fuel Pump Driver Control Module over CAN bus is incorrect for out of total samples	 >= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 100ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Temperature Erratic	P100C	This DTC monitors for an erratic Temperature signal via LIN bus from the Battery Monitor Module	Communication of the Temperature signal from the Battery Monitor Module has become erratic or is incorrect for out of total samples	>= 4 counts >= 5 counts	The diagnostic is enabled All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= 1 (1 indicates enabled) >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	LIN bus communication executes in 500ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Internal Temperature Circuit Erratic	P100D	This DTC monitors for an erratic Temperature Circuit signal via LIN bus from the Battery Monitor Module	Communication of the Temperature Circuit signal from the Battery Monitor Module has become erratic or is incorrect for out of total samples	>= 4 counts >= 5 counts	The diagnostic is enabled All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= 1 (1 indicates enabled) >= 3,000.00 milliseconds = 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.
Fuel Pump Phase U-V-W Circuit Open	P1029	This DTC detects if any of the 3phase fuel pump control circuits is Open [system configuration "Brushless"] The diagnostic can detect open circuit faults when the fuel pump is not rotating. In the "stopped" state, small currents are injected into each motor phase circuit pair by an internal fixed source and corresponding back-EMF voltage is monitored. A fault is reported when the monitored voltage falls into a specific range [adjusted for source voltage]. This process is completed in less than 1 millisecond. The FTZM ERFS control samples back-Electromotive Force [EMF] for zero voltage-level crossings as a detection method to enable closed loop control brushless commutation. Back EMF is an electrical characteristic of the inactive phase of the 3-phase signal wherein only 2 phases are	Phased-pair circuit voltage	3V <= V [back-EMF] <= 6V	a) Sensed fuel pump speed b) Device configuration FCBR_e_ChassisFuelPressSysType c) Diagnostic Enabled - KeFABR_b_OpenCktDiagEnbl d) CAN Sensor Bus message $3EC_Avail e) Sensor Bus Relay On f) Sensor Bus B Message $3EC Temp Signal Message Counter Incorrect [CFMR_b_FTZM_Info7_ARC_ChkErr]	a) == 0 RPM b) CeFCBR_e_DSL_ECM_FTZM_BLDC_Sys c) == TRUE d) == TRUE e) == TRUE f) <> TRUE	40.00 failures / 80.00 samples 1 sample / 100 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		active at any moment. Brushless fuel pump speed is inferred using the rate of zero-crossings detection and number of motor pole-pairs. Speed is reported to the ECM as serial data every 10 milliseconds. This open circuit diagnostic follows "smart device" Component Technical Specifications.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Phase U-V-W Circuit Low	P102A	This DTC detects if the fuel pump control circuit is shorted to low [Short to Ground] The diagnostic detects short-to-ground faults using 2 methods depending on whether the fuel pump is rotating. 1) In the "rotating" state, voltage drop across each phase-pair high-side drive is monitored, or 2) in the "stopped" state, small currents are injected into each motor phase circuit pair	Phased-pair circuit voltage Difference	Vdelta > 0.145 V	a) Device configuration FCBR_e_ChassisFuelPresSysType b) Diagnostic KeFABR_b_GshtCktDiagEnbl c) CAN Sensor Bus message $3EC_Avail d) Sensor Bus Relay On e) Sensor Bus Message $3EC Temp Signal Message Counter Incorrect [CFMR_b_FTZM_Info7_ARC_ChkErr]	a) == CeFCBR_e_DSL_ECM_FTZM_BLDC_Sys b) == TRUE c) == TRUE d) == TRUE e) <> TRUE	40.00 failures / 80.00 samples 1 sample / 100 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		by an internal fixed source and corresponding back-EMF voltage is monitored. A fault is reported when the monitored voltage falls into a specific range [adjusted for source voltage]. The FTZM ERFS control samples back-Electromotive Force [EMF] for zero voltage-level crossings as a detection method to enable closed loop control brushless commutation. Back EMF is an electrical characteristic of the inactive phase of the 3-phase signal wherein only 2 phases are active at any moment. Brushless fuel pump speed is inferred using the rate of zero-crossings detection and number of motor pole-pairs. Speed is reported to the ECM as serial data every 10 milliseconds. This open circuit diagnostic follows "smart device" Component Technical Specifications.	Phased-pair circuit voltage	V [back-EMF] >= 6 V	a) Sensed fuel pump speed b) Device configuration FCBR_e_ChassisFuelPresSysType c) Diagnostic KeFABR_b_GshtCktDiagEnbl d) CAN Sensor Bus message $3EC_Avail e) Sensor Bus Relay On f) Sensor Bus Message $3EC Temp Signal Message Counter Incorrect [CFMR_b_FTZM_Info7_ARC_ChkErr]	a) == 0 RPM b) == CeFCBR_e_DSL_ECM_FTZM_BLDC_Sys c) == TRUE d) == TRUE e) == TRUE f) <> TRUE	40.00 failures / 80.00 samples 1 sample / 100 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Phase U-V-W Circuit High	P102B	This DTC detects if the fuel pump control circuit is shorted to high voltage [Short to Battery] The diagnostic detects short-to-battery faults using 2 methods depending on whether the fuel pump is rotating. 1) In the "rotating" state, voltage drop across each phase-pair low-side current shunt is monitored, or 2) in the "stopped" state, small currents are injected	Phased-pair circuit voltage Difference	Vdelta > 0.4 V	a) Device configuration FCBR_e_ChassisFuelPresSysType b) Diagnostic KeFABR_b_PshtCktDiagEnbl c) CAN Sensor Bus message $3EC_Avail d) Sensor Bus Relay On e) Sensor Bus Message $3EC Temp Signal Message Counter Incorrect [CFMR_b_FTZM_Info7_ARC_ChkErr]	a) == CeFCBR_e_DSL_ECM_FTZM_BLDC_Sys b) == TRUE c) == TRUE d) == TRUE e) <> TRUE	40.00 failures / 80.00 samples 1 sample / 100 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		into each motor phase circuit pair by an internal fixed source and corresponding back-EMF voltage is monitored. A fault is reported when the monitored voltage falls into a specific range [adjusted for source voltage]. The FTZM ERFS control samples back-Electromotive Force [EMF] for zero voltage-level crossings as a detection method to enable closed loop control brushless commutation. Back EMF is an electrical characteristic of the inactive phase of the 3-phase signal wherein only 2 phases are active at any moment. Brushless fuel pump speed is inferred using the rate of zero-crossings detection and number of motor pole-pairs. Speed is reported to the ECM as serial data every 10 milliseconds. This open circuit diagnostic follows "smart device" Component Technical Specifications.	Phased-pair circuit voltage	V[backEMF] > 6 V	a) Sensed fuel pump speed b) Device configuration FCBR_e_ChassisFuelPresSysType b) Diagnostic KeFABR_b_PshtCktDiagEnbl c) CAN Sensor Bus message $3EC_Avail d) Sensor Bus Relay On e) Sensor Bus Message $3EC Temp Signal Message Counter Incorrect [CFMR_b_FTZM_Info7_ARC_ChkErr]	a) == 0 RPM b) == CeFCBR_e_DSL_ECM_FTZM_BLDC_Sys b) == TRUE c) == TRUE d) == TRUE e) <> TRUE	40.00 failures / 80.00 samples 1 sample / 100 msec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Wastegate Actuator "A" Supply Circuit Low Voltage	P1038	Controller specific output driver circuit diagnostic, diagnosing for the 'electric waste gate 'A' actuator' H-bridge driver low voltage failure. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Motor driver voltage supply outside of controller specific acceptable range during on state indicates low voltage.	< 6 V between main powertrain supply and controller ground	Diagnostic enabled ***************************** Powertrain relay voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts *****************************	10 failures out of 12 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Wastegate Actuator "A" Control Circuit Shorted	P103A	Controller specific output driver circuit diagnostic, diagnosing for the 'electric waste gate actuator A' actuator' H-bridge driver load short failure. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Voltage measurement outside of controller specific acceptable range during driver on state indicates a load short failure.	≤ 0.5 Ω impedance between motor output A and motor output B	Diagnostic enabled ***************************** Powertrain relay voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts *****************************	10 failures out of 12 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Heater Supply Voltage Sense Circuit Range/ Performance	P103B	The P103B diagnostic determines if the heater supply circuit is rational by comparing the heater supply voltage to the run crank voltage and calculating the difference. The heater supply voltage input is connected to the O2 heater supply circuit inside the vehicle relay center. It is representative of the voltage supplied to the O2 heaters. The O2 heater voltage is used by the HWIO to calculate the O2 heater resistance on switching type O2 sensors (non-WRAF). With a fault set, the resistance calculation is performed with run crank voltage. The diagnostic failure counter is incremented if the voltage difference is greater than the threshold. This DTC is set based on the fail and sample counters.	The absolute value of Heater Supply Voltage delta from Run Crank voltage	> 2.00 volts	Powertrain relay in range (Relay in range is defined as relay voltage Run Crank signal active	= True > 11.00 volts) = True (Please see "**Run/Crank Active conditiions**" in Supporting Tables)	8 failures out of 10 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Heater Supply Voltage Sense Circuit Low	P103C	The P103C diagnostic determines if the heater supply circuit is low by comparing the heater supply voltage to the threshold. The heater supply voltage input is connected to the O2 heater supply circuit inside the vehicle relay center. It is representative of the voltage supplied to the O2 heaters. The O2 heater voltage is used by the HWIO to calculate the O2 heater resistance on switching type O2 sensors (non-WRAF). With a fault set, the resistance calculation is performed with run crank voltage. The diagnostic failure counter is incremented if the heater supply voltage is less than the threshold. This DTC is set based on the fail and sample counters.	Heater Supply Voltage	< 6.00 volts	Powertrain relay in range (Relay in range is defined as relay voltage Run Crank signal active	= True > 11.00 volts) = True (Please see "**Run/Crank Active conditiions**" in Supporting Tables)	8 failures out of 10 samples 250 ms / sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Pump Control Signal Message Counter Incorrect	P103D	This DTC monitors for an error in communication with the Engine Coolant Pump Control Signals	Communication of the Alive Rolling Count or Protection Value of the Engine Coolant Pump Control Signal Message over LIN bus is incorrect for out of total samples	>= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes 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.
Engine Coolant Bypass Valve C Position Sensor Circuit Low	P1096	Circuit Continuity This DTC detects a short to ground in the position sensor signal circuit. This is accomplished by monitoring the reported position. If the position goes out of the expected range the DTC is set.	Engine Coolant Bypass Valve C Positions Sensor SENT digital read value	< 50	SENT communitation is not in error Run Crank Ignition in Range Engine not cranking Engine Diag System	VECR_MRV_LoC_FP = True = True = Enabled	4 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.
Engine Coolant Bypass Valve C Position Sensor Circuit High	P1097	Circuit Continuity This DTC detects a short to power in the position sensor signal circuit. This is accomplished by monitoring the reported position. If the position goes out of the expected range the DTC is set.	Engine Coolant Bypass Valve C Positions Sensor SENT digital read value	> 4,050	SENT communitation is not in error Run Crank Ignition in Range Engine not cranking Engine Diag System	VECR_MRV_LoC_FP = True = True = Enabled	4 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.
Engine Coolant Bypass Valve C Position Sensor Stop Performance	P1098	Performance Check This DTC checks for an invalid endstop learn. The valve is moved against each endstop. If the learned position is out of range a DTC will be set.	If any of the following conditions are met a failure will be recorded: Condition 1 (closed): Learned bypass valve position or and the learn has completed Condition 2 (open): Learned bypass valve position or and the learn has completed	> 0.00 degrees < -10.00 degrees > 318.00 degrees < 308.00 degrees	No DTCs Engine Diag System Bypass Valve Learn Engine Outlet Coolant OR OBD Coolant Enable Criteria Engine Outlet Coolant AND Engine Hot Light	EECR_EngineOutlet_FA VECR_MRV_LoC_FA VECR_MRV_PstnSnsrCkt_FA VECR_MRV_PstnSnsrCkt_TFTKO VECR_MRV_PstnPerf_FA = Enabled = Successful or Inprogress ≥ -40.0 ºC = TRUE ≤ 9,999.0 ºC = Inactive	Within 60.0 seconds after engine shutdown.	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 Bypass Valve C Motor Current High	P10A0	Controller specific output driver circuit detects an overcurrent condition in the load circuit for the Engine Coolant Bypass Valve C when the H-Bridge is energized.	Current measurement outside of controller specific acceptable range when H-Bridge is energized	8.1A ≤ X ≤ 12.8A	Run Crank Ignition in Range Engine not cranking Engine Diag System Driver over current status is not	= True = True = Enabled = Indeterminate	2 seconds out of a 5 seconds window	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 Bypass Valve C Control Circuit Shorted	P10A1	Controller specific output driver circuit detects a short to ground in the load circuit for the Engine Coolant Bypass Valve C when the H-Bridge is energized.	Current measurement outside of controller specific acceptable range when H-Bridge is energized	9.8A ≤ X ≤ 15.8A	Run Crank Ignition in Range Engine not cranking Engine Diag System Driver control circuit load short status is not	= True = True = Enabled = Indeterminate	4 seconds out of a 5 seconds window	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 Bypass Valve C Actuator Driver Temperature Too High	P10A2	Controller specific temperature threshold. If temperature becomes too high this DTC will set.	Temperature measurement outside of controller specific acceptable range.	≥ 105ºC	Run Crank Ignition in Range Engine not cranking Engine Diag System Driver overtemperature status is not	= True = True = Enabled = Indeterminate	4 seconds out of a 5 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Injection Pulse Performance	P10A3	Diagnostic to determine if injection pulse total compensation for cylinder 1 is less than the minimum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	< **P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below)	= True	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips
					FULR_b_FPV_MeasDiag_TFTKO	= True		
					Uncompensated Injection Pulse Width (Injection is commanded)	> 0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Injection Pulse Performance	P10A4	Diagnostic to determine if injection pulse total compensation for cylinder 1 is greater than the maximum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	> **P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag _TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Injection Pulse Performance	P10A5	Diagnostic to determine if injection pulse total compensation for cylinder 2 is less than the minimum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	< **P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag _TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Injection Pulse Performance	P10A6	Diagnostic to determine if injection pulse total compensation for cylinder 2 is greater than the maximum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	> **P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag_TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 3 Injection Pulse Performance	P10A7	Diagnostic to determine if injection pulse total compensation for cylinder 3 is less than the minimum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	< **P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag _TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 3 Injection Pulse Performance	P10A8	Diagnostic to determine if injection pulse total compensation for cylinder 3 is greater than the maximum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	> **P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag_TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Injection Pulse Performance	P10A9	Diagnostic to determine if injection pulse total compensation for cylinder 4 is less than the minimum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	< **P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag_TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Injection Pulse Performance	P10AA	Diagnostic to determine if injection pulse total compensation for cylinder 4 is greater than the maximum fail limit. The injection pulse total compensation is the sum of the opening magnitude and closing time compensation. Opening Magnitude and closing time compensation are determined using the voltage feedback across the injector enable and command wires.	Total Injection Small Pulse compensation	> **P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) FULR_b_FPV_MeasDiag_TFTKO Uncompensated Injection Pulse Width (Injection is commanded)	= True = True > 0	400.00 failures out of 1,520.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor A / C Correlation (applications with LIN MAF)	P10BC	Detects a performance failure in the Barometric Pressure (BARO) sensor, such as when a BARO value is stuck in range. With this monitor, the BARO sensor is compared to a redundant sensor called BARO C. If the BARO sensor value is not similar to the BARO C sensor value, then the BARO Sensor A/C Correlation diagnostic will fail.	Difference between BARO A Sensor reading and BARO C Sensor reading	> 15.0 kPa	LIN Communications established with MAF		160 failures out of 200 samples 1 sample every 25 msec	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 Control Circuit Short	P10E8	Controller specific output driver circuit diagnoses High Pressure pump Control Solenoid high sided driver for a short to low side 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.
EVAP Purge Pump Status Message Counter Incorrect	P10F5	This DTC monitors for an error in communication with the EVAP Purge Pump Status Message Signals	Communication of the Alive Rolling Count or Protection Value of the EVAP Purge Pump Status Signal Message over LIN bus is incorrect for out of total samples	 >= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Inlet Airflow System Performance (single turbo)	P1101	Detects a performance failure in the Manifold Pressure (MAP) sensor, Turbocharger Boost Pressure sensor, Throttle Position sensor (TPS) or Mass Air Flow (MAF) sensor that cannot be uniquely identified as a failure in one individual sensor. This diagnostic can set when more than one of these sensors has a performance concern. This diagnostic is performed using the Intake Flow Rationality Diagnostic (IFRD). IFRD calculates modeled values of sensors from these four sensors. These modeled values are compared against the actual sensor values to see if they are similar. If they are similar, then the model passes. If they are not similar, then that model is considered to be failed. Certain combinations of model passes and model failures can be interpreted to be caused by a performance issue with	See table **P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix** for combinations of model failures that can set this DTC. MAF model fails when ABS(Measured Flow – Modeled Air Flow) Filtered MAP1 model fails when ABS(Measured MAP – MAP Model 1) Filtered MAP2 model fails when ABS(Measured MAP – MAP Model 2) Filtered MAP3 model fails when ABS(Measured MAP – MAP Model 3) Filtered TIAP1 model fails when ABS(Measured TIAP – TIAP Model 1) Filtered TPS model fails when Filtered Throttle Model Error TIAP Correlation model fails when High Engine Air Flow is TRUE AND Measured TIAP -	> 25.0 grams/sec > 30.0 kPa > 30.0 kPa > 30.0 kPa > 30.0 kPa > 350 kPa*(g/s)	Engine Speed Engine Speed (Coolant Temp OR OBD Coolant Enable Criteria (Coolant Temp OR OBD Max Coolant Achieved Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together) See Residual Weight Factor tables.	>= 400 RPM <= 5,700 RPM >= -9 Deg C = TRUE) <= 130 Deg C = FALSE) >= -20 Deg C <= 125 Deg C >= 0.50 Modeled Air Flow Error multiplied by **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM** and **P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est** MAP Model 1 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM**	Continuous Calculation are performed every 12.5 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the system, but no single failed sensor can uniquely be identified. In this case, the Inlet Airflow System Performance diagnostic will fail.	measured MAP - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset** OR Low Engine Air Flow is TRUE AND Measured TIAP - measured Baro - offset as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset** TIAP Correlation is valid when High Engine Air Flow has been TRUE for a period of time OR Low Engine Air Flow has been TRUE for a period of time High Engine Air Flow is TRUE when Mass Air Flow	> 30.0 kPa > 30.0 kPa > 1.0 seconds > 1.0 seconds > a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow**	No Active DTCs: No Pending DTCs:	MAP Model 2 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM** MAP Model 3 Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM** TIAP Model 1 Error multiplied by **P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM** Filtered Throttle Model Error multiplied by **P0101, P0106, P0121, P012B, P0236, P1101: TPS Residual Weight Factor based on RPM** MAP_SensorCircuitFA EGRValvePerformance_FA MAF_SensorCircuitFA CrankSensor_FA ECT_Sensor_FA IAT_SensorFA MnfdTempSensorFA TC_BoostPresSnsrCktFA AmbientAirDefault 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.
			AND Manifold Pressure AND Filtered Mass Air Flow - Mass Air Flow Low Engine Air Flow is TRUE when Mass Air Flow AND Manifold Pressure AND Mass Air Flow - Filtered Mass Air Flow	> a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP** < 3.0 gm/sec < a threshold in gm sec as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow** < a threshold in kPa as a function of engine speed See table **P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP** < 2.0 gm/sec		MnfdTempSensorCktFP		

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.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr1 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_EngineOutlet_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA	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.
			The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location associated with the physical (Temperature) sensor number. **Bypass Inlet:** CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Engine Block:** CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B:	20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_DwnStmSnsr - BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis **Bypass Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Engine Block:** Propulsion Off Soak Time Ambient Air Temperature **Engine Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Head Coolant:** Propulsion Off Soak Time Ambient Air Temperature **Heater Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Heater Outlet:** Propulsion Off Soak Time Ambient Air Temperature **Radiator Outlet:** Propulsion Off Soak Time Ambient Air Temperature	EGRTempSensorDNSS_FA LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine Inlet: CeEECR_e_PhysSnsr2 Comparison sensor 1: CeEECR_e_BiasChkManfldAirSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterNoEffect Threshold A: Threshold B: **Head Coolant:** CeEECR_e_PhysSnsr6 Comparison sensor 1: CeEECR_e_BiasChkBlockClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasBoth Threshold A: Threshold B: **Heater Inlet:** CeEECR_e_PhysSnsr4 Comparison sensor 1: CeEECR_e_BiasChkEngOutClntSnsr Comparison sensor 2:	12.44 ºC 12.44 ºC 20.03 ºC 8.69 ºC	================= Comparison sensor 1 & 2 are not ================= Aux Heat Detection Aux heat detection can only be enabled the following are met: No Active DTCs At power-up a warm sensor and cool sensor are compared Warm sensor Cool sensor If the warm sensor is compared to the cool sensor Propulsion Off Soak Time Engine Off Soak Time Ambient Air Temperature There are 4 different types of aux heater detection for this	= CeEECR_e_BiasChkNoSelection Same set as listed above and EngineModeNotRunTimerError EngineModeNotRunTimer_FA VehicleSpeedSensor_FA CeAEHR_e_BlkHtrBlockClntSnsr CeAEHR_e_BlkHtrRadOutClntSnsr > 7.40 ºC > 21,600 seconds > 21,600 seconds > -20.00 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_BiasChkBlo		application:			
			ckClntSnsr					
			Fuel Operated heater:		2x2 signature	Enabled		
			CeEECR_e_AuxHeaterN		Absolute Drop	Enabled		
			oEffect		IAT Drop	Disabled		
			Block Heater:		Temperature Derivative	Disabled		
			CeEECR_e_AuxHeaterBi					
			asBoth	17.82 ºC	**2x2 Signature Criteria:**			
			Threshold A:	7.74 ºC				
			Threshold B:		The warm sensors			
					Sensor 1:	CeAEHR_e_BlkHtrCylHd		
			Heater Outlet:			ClntSnsr		
			CeEECR_e_PhysSnsr5		Sensor 2:	CeAEHR_e_BlkHtrHtrCrI		
			Comparison sensor 1:			nClntSnsr		
			CeEECR_e_BiasChkHtr					
			CrInClntSnsr		The cool sensors			
			Comparison sensor 2:		Sensor 1:	CeAEHR_e_BlkHtrRadO		
			CeEECR_e_BiasChkEng			utClntSnsr		
			OutClntSnsr		Sensor 2:	CeAEHR_e_BlkHtrOutsid		
			Fuel Operated heater:			eAirSnsr		
			CeEECR_e_AuxHeaterN		A block heater will be			
			oEffect		detected if the warm			
			Block Heater:		sensors are within	5.0 ºC		
			CeEECR_e_AuxHeaterBi		AND			
			asLow	18.83 ºC	The cool sensors are			
			Threshold A:	9.84 ºC	within	5.0 ºC		
			Threshold B:		AND			
					The delta between the			
			Radiator Outlet:		two groups (warm/cold)	> 16.0 ºC		
			CeEECR_e_PhysSnsr3					
			Comparison sensor 1:		**Absolute Drop Criteria:**			
			CeEECR_e_BiasChkEng					
			InClntSnsr		The	CeAEHR_e_BlkHtrBlock		
			Comparison sensor 2:		is monitored for a drop.	ClntSnsr		
			CeEECR_e_BiasChkMa					
			nfldAirSnsr		The drop will be			
			Fuel Operated heater:		monitored for once			
			CeEECR_e_AuxHeaterN		coolant flow is	> 87.00 L/min		
			oEffect		AND			
			Block Heater:		Flow time is between	0.1 - 17.0 seconds		
			CeEECR_e_AuxHeaterBi		AND			
			asLow	19.49 ºC	Engine runtime is	< 77.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Threshold A: Threshold B: A failure will be reported if any of the following conditions are met. Evaluated in order: 1) This sensor is above both comparison sensors 2) This sensor is below both comparison sensors 3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew 4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	17.85 ºC >A ºC >A ºC >B ºC >B ºC	A block heater is detected if a drop is **IAT Drop Criteria:** A block heater will be detected if: IAT has a drop of during a drive defined by: Drive time Vehicle speed Addtional drive time is provided when vehicle speed drops below above threshold as follows This detection method will abort if the engine is off OR Engine runtime **Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will	> 1.8 ºC ≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph 0.5 times the seconds with vehicle speed below the threshold above > 180.0 seconds > 1,800 seconds CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					increment if derivative is If counts are a block heater is detected ================	< -0.10 ºC/sec ≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT 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)	> 15.00 degC	Fuel Temperature Rationality Diagnostic Enabled	True	100.00 failures out of 125.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
						Enabled when a code clear is not active or not exiting device control		
						Temperature sensors 1 out of range Low or High Fault Active (P0182, P0182)		
					No Fault Active on	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.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadiatorCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr - BiasChk_EGR_DwnStmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_RadiatorOutlet_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA EGRTempSensorDNSS_FA	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.
			associated with the physical (Temperature) sensor number. Bypass Inlet: CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: Engine Block: CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B: Engine Inlet: CeEECR_e_PhysSnsr2 Comparison sensor 1:	20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis **Bypass Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Engine Block:** Propulsion Off Soak Time Ambient Air Temperature **Engine Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Head Coolant:** Propulsion Off Soak Time Ambient Air Temperature **Heater Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Heater Outlet:** Propulsion Off Soak Time Ambient Air Temperature **Radiator Outlet:** Propulsion Off Soak Time Ambient Air Temperature =================	LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_BiasChkMa nfldAirSnsr Comparison sensor 2: CeEECR_e_BiasChkEng OutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect Block Heater: CeEECR_e_AuxHeaterN oEffect Threshold A: Threshold B: Head Coolant: CeEECR_e_PhysSnsr6 Comparison sensor 1: CeEECR_e_BiasChkBlo ckClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEng OutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect Block Heater: CeEECR_e_AuxHeaterBi asBoth Threshold A: Threshold B: Heater Inlet: CeEECR_e_PhysSnsr4 Comparison sensor 1: CeEECR_e_BiasChkEng OutClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlo ckClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect	12.44 ºC 12.44 ºC 20.03 ºC 8.69 ºC	Comparison sensor 1 & 2 are not ================= Aux Heat Detection Aux heat detection can only be enabled the following are met: No Active DTCs At power-up a warm sensor and cool sensor are compared Warm sensor Cool sensor If the warm sensor is compared to the cool sensor Propulsion Off Soak Time Engine Off Soak Time Ambient Air Temperature There are 4 different types of aux heater detection for this application: 2x2 signature	= CeEECR_e_BiasChkNoS election Same set as listed above and EngineModeNotRunTimer Error EngineModeNotRunTimer _FA VehicleSpeedSensor_FA CeAEHR_e_BlkHtrBlock ClntSnsr CeAEHR_e_BlkHtrRadO utClntSnsr > 7.40 ºC > 21,600 seconds > 21,600 seconds > -20.00 ºC Enabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Block Heater: CeEECR_e_AuxHeaterBiasBoth Threshold A: Threshold B: Heater Outlet: CeEECR_e_PhysSnsr5 Comparison sensor 1: CeEECR_e_BiasChkHtrCrInClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: Radiator Outlet: CeEECR_e_PhysSnsr3 Comparison sensor 1: CeEECR_e_BiasChkEngInClntSnsr Comparison sensor 2: CeEECR_e_BiasChkManfldAirSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: A failure will be reported if any of the following	17.82 ºC 7.74 ºC 18.83 ºC 9.84 ºC 19.49 ºC 17.85 ºC	Absolute Drop IAT Drop Temperature Derivative **2x2 Signature Criteria:** The warm sensors Sensor 1: Sensor 2: The cool sensors Sensor 1: Sensor 2: A block heater will be detected if the warm sensors are within AND The cool sensors are within AND The delta between the two groups (warm/cold) **Absolute Drop Criteria:** The is monitored for a drop. The drop will be monitored for once coolant flow is AND Flow time is between AND Engine runtime is	Enabled Disabled Disabled CeAEHR_e_BlkHtrCylHdClntSnsr CeAEHR_e_BlkHtrHtrCrInClntSnsr CeAEHR_e_BlkHtrRadOutClntSnsr CeAEHR_e_BlkHtrOutsideAirSnsr 5.0 ºC 5.0 ºC > 16.0 ºC CeAEHR_e_BlkHtrBlockClntSnsr > 87.00 L/min 0.1 - 17.0 seconds < 77.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			conditions are met. Evaluated in order: 1) This sensor is above both comparison sensors 2) This sensor is below both comparison sensors 3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew 4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	>A ºC >A ºC >B ºC >B ºC	A block heater is detected if a drop is **IAT Drop Criteria:** A block heater will be detected if: IAT has a drop of during a drive defined by: Drive time Vehicle speed Addtional drive time is provided when vehicle speed drops below above threshold as follows This detection method will abort if the engine is off OR Engine runtime **Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will increment if derivative is	> 1.8 ºC ≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph 0.5 times the seconds with vehicle speed below the threshold above > 180.0 seconds > 1,800 seconds CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds < -0.10 ºC/sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					If counts are a block heater is detected =================	≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module 5V Reference 1 Circuit	P1176	This DTC monitors for an error in the Fuel Pump Driver Control Module 5V Reference 1 Circuit	Raw Fuel Pump Driver Control Module 5V Reference 1 is or Raw Fuel Pump Driver Control Module 5V Reference 1 is or Absolute difference of the filtered Fuel Pump Driver Control Module 5V Reference 1 and Raw Fuel Pump Driver Control Module 5V Reference 1 is For a non-continuous failure of out of For a continuous failure of	> 92.25 Percent < 87.75 Percent > 0.90 Percent 40.00 counts 80.00 counts 0.20 seconds	Diagnostic is enabled Run/Crank Ignition Voltage U0076 PT Sensor Bus Relay Communication with the Fuel Tank Zone Module is not lost	1.00 (1 indicates enabled) >= 11.00 Volts Is not active Commanded on (if present)	Executes in 12.5ms loop.	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 5V Reference 2 Circuit	P1177	This DTC monitors for an error in the Fuel Pump Driver Control Module 5V Reference 2 Circuit	Raw Fuel Pump Driver Control Module 5V Reference 2 is or Raw Fuel Pump Driver Control Module 5V Reference 2 is or Absolute difference of the filtered Fuel Pump Driver Control Module 5V Reference 2 and Raw Fuel Pump Driver Control Module 5V Reference 2 is For a non-continuous failure of out of For a continuous failure of	> 92.25 Percent < 87.75 Percent > 0.90 Percent 40.00 counts 80.00 counts 0.20 seconds	Diagnostic is enabled Run/Crank Ignition Voltage U0076 PT Sensor Bus Relay Communication with the Fuel Tank Zone Module is not lost	1.00 (1 indicates enabled) >= 11.00 Volts Is not active Commanded on (if present)	Executes in 12.5ms loop.	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 Fuel Level Sensor 1 Internal Supply Circuit	P1178	This DTC monitors for an error in the Fuel Pump Driver Control Module Fuel Level Sensor 1 Internal Supply Circuit	Raw Fuel Pump Driver Control Module Fuel Level Sensor 1 Internal Supply Circuit is or Raw Fuel Pump Driver Control Module Fuel Level Sensor 1 Internal Supply Circuit is or Absolute difference of the filtered Fuel Pump Driver Control Module Fuel Level Sensor 1 Internal Supply Circuit and Raw Fuel Pump Driver Control Module Fuel Level Sensor 1 Internal Supply Circuit is For a non-continuous failure of out of For a continuous failure of	> 92.25 Percent < 87.75 Percent > 0.90 Percent 40.00 counts 80.00 counts 0.20 seconds	Diagnostic is enabled Run/Crank Ignition Voltage U0076 PT Sensor Bus Relay Communication with the Fuel Tank Zone Module is not lost	1.00 (1 indicates enabled) >= 11.00 Volts Is not active Commanded on (if present)	Executes in 50.0ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Bypass Valve D Control Signal Message Counter Incorrect	P117A	This DTC monitors for an error in communication with the Engine Coolant Bypass Valve D Control Signals	Communication of the Alive Rolling Count or Protection Value of the EVAP Purge Pump Status Signal Message over LIN bus is incorrect for out of total samples	 >= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes 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.
Engine Block Coolant Valve Position Sensor Circuit Low Voltage	P118A	This diagnostic continuously detects if the Block Rotary Valve Position Feedback signal is too low and out of the expected operating range, defined by any position below the lower mechanical end-stop. If the enable criteria are met and the raw position feedback is below the out of range low position 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. This diagnostic will suspend when a matured fault is detected while the valve is performing the integrity check and will re-enable when the valve performs the integrity check again at the end of the next drive cycle.	Coolant Valve Position Feedback	< -7.00 °	If Integrity Check Fault Active is FALSE, then the following must be satisfied [12V System Voltage VECR_BRV_PstnFdbk_Av , VECR_BRV_PstnFdbk_Fol PowertrainRelayStateOn_FA , Powertrain Relay Feedback Circuit DTCs P0689, P0690 Powertrain Relay Commanded On] If Integrity Check Fault Active is TRUE, then the following must be satisfied for [12V System Voltage VECR_BRV_PstnFdbk_Av , VECR_BRV_PstnFdbk_Fol PowertrainRelayStateOn_FA , Powertrain Relay Feedback Circuit DTCs P0689, P0690	 >= 11.00 V (hystersis disable < 10.00 V) = No Fault Pending = No Fault Active = True >= 2.50 seconds >= 11.00 V (hystersis disable < 10.00 V) = No Fault Pending = No Fault Active	4 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.
					Powertrain Relay Commanded On Coolant Valve Commanded Position]	= True <= -15.00 °		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Block Coolant Valve Position Sensor Circuit High Voltage	P11C9	This diagnostic continuously detects if the Block Rotary Valve Position Feedback signal is too high and out of the expected operating range, defined by any position above the upper mechanical endstop. If the enable criteria are met and the raw position feedback is greater than the out of range high 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. This diagnostic will suspend when a matured fault is detected while the valve is performing the integrity check and will re-enable when the valve performs the integrity check again at the end of the next drive cycle.	Coolant Valve Position Feedback	> 117.00 °	If Integrity Check Fault Active is FALSE, then the following shall be satisfied [12V System Voltage VECR_BRV_PstnFdbk_Av , VECR_BRV_PstnFdbk_Fol PowertrainRelayStateOn_FA , Powertrain Relay Feedback Circuit DTCs P0689, P0690 Powertrain Relay Commanded On] If Integrity Check Fault Active is TRUE, then the following must be satisfied for [12V System Voltage VECR_BRV_PstnFdbk_Av , VECR_BRV_PstnFdbk_Fol PowertrainRelayStateOn_FA , Powertrain Relay Feedback Circuit DTCs P0689, P0690	 >= 11.00 V (hystersis disable < 10.00 V) = No Fault Pending = No Fault Active = True >= 2.50 seconds >= 11.00 V (hystersis disable < 10.00 V) = No Fault Pending = No Fault Active	4 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.
					Powertrain Relay Commanded On Coolant Valve Commanded Position]	= True >= 125.00 °		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Command Signal Message Counter Incorrect	P11FF	This DTC monitors for an error in communication with the Fuel Pump Command Signals	Communication of the Alive Rolling Count or Protection Value from the Fuel Control System over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage And Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 1 Signal Message Counter Incorrect	P1200	This DTC monitors for an error in communication with the Fuel Pump Control Module (FTZM) Fuel Level Sensor 1 Signal Message Counter	Communication of the Fuel Level Sensor 1 Signal Message Counter from the Fuel Pump Control Module (FTZM) over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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. The FTZM ERFS control may adjust the PWM slew rate or frequency as a self-protection method, but may not reduce pump rotational speed or impact pumping performance in any way due to an over-temperature condition.	Fuel Pump Driver Temperature	T > 160 degC	a) Diagnostic enabled [KeFABR_b_OvertempDiagEnbl] b) Sensor Bus Relay On c) CAN Sensor Bus message $3EC_Available d) Sensor Bus Message $3EC Temp Signal Message Counter Incorrect [CFMR_b_FTZM_Info7_ARC_ChkErr]	a) == TRUE b) == TRUE c) == TRUE d) <> TRUE	5.00 failures / 10.00 samples 1 sample / 100 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			50.00 failures out of 62.00 samples 100 ms per Sample Continuous	Type B, 2 Trips
					No Fault Active on	Enabled when a code clear is not active or not exiting device control SENT Communication Fault Active (P16E4, P16E5) Fuel Temperature Sensor SENT Message Error Fault Active (P128C)		
					No Fault Pending on	Fuel Temperature Sensor SENT Message Error Fault Pending (P128C)		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail High Pressure Sensor 2 Out of Range	P127C	This DTC diagnose SENT high pressure sensor 2 that is too low out of range. If the sensor digital value (represnting the refernce voltage) is below the lower digital threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported. A pass is reported for this DTC if the low sample counter reaches its threshold.	High Pressure Rail Sensor 2 SENT digital read value	=< 66			Time Based: 400 Failuer out of 500 Samples 6.25 ms per Sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure Sensor 1 Internal Performance	P128A	This DTC determines if there is internal error within the SENT pressure sensor 1 (i.e. Broken wire bond internal to the SENT Sensor). Once the internal error is detected a fixed faulted digital values is communicated to the ECU.	Digital pressure sesnor 1 value	>= 4,089		Enabled when a code clear is not active or not exiting device control	400 failures out of 500 samples	Type A, 1 Trips
					SENT Fuel Rail Pressure Sensor Internal Performance Enable	True	6.25 ms per Sample Continuous	
					No 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	400 failures out of 500 samples	Type A, 1 Trips
					SENT Fuel Rail Pressure Sensor Internal Performance Enable	True	6.25 ms per Sample Continuous	
					No Fault Pending	P16E4 P16E5 P128F		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure &Temperature Sensor Temperature 1 Message Incorrect	P128C	This DTC diagnoses the the communication errors on the temperature 1 serial data channel	Serial Message 1 Age	>= 0.03 ms	SENT signal Serial waveform diagnostics enable SENT power up delay No Fault Active	True >= 0.00 seconds P16E4 P16E5	134 failures out of 167 samples 6.25 ms per sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Temperature 2 Message Incorrect	P128D	This DTC diagnoses the the communication errors on the temperature 2 serial data channel	Serial Message 2 Age	>= 0.03 ms	SENT signal Serial waveform diagnostics enable SENT power up delay No Fault Active	True >= 0.00 seconds P16E4 P16E5	134 failures out of 167 samples 6.25 ms per sample Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Pressure Message Incorrect	P128F	This DTC determines if there is any SENT signal waveform for discrepancies (i.e. too many pulse, too few pulse, clock shift). The SENT HWIO Determines message waveform fault (i.e.too many pulse, too few pulse, clock shift) and if the message age is too long.	SENT HWIO Determines message fault (i.e.too many pulse, too few pulse, clock shift) Message Age	= true > 1.69 ms	SENT signal Serial waveform diagnostics enable SENT power up delay No Fault Active on	True >= 0.00 seconds Enabled when a code clear is not active or not exiting device control P16E4 P16E5	400 failures out of 500 samples 6.25 ms per sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module System Ignition Switch Run/ Start Position Circuit Low (Only on applications that use an FTZM)	P129D	Detects low 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 is below a calibrated value.	Fuel Pump Driver Control Module Ignition switch Run/Start position circuit low	FTZM Run Crank Active is FALSE	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 = TRUE	40 failures out of 50 samples 50 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Fuel Pump Speed Signal Incorrect	P129F	FTZM ERFS control samples back-Electromotive Force [EMF] for zero voltage-level crossings as a detection method to enable closed loop control brushless commutation. Back EMF is an electrical characteristic of the inactive phase of the 3-phase signal wherein only 2 phases are active at any moment. Brushless pump speed is inferred using rate of zero-crossings detection and number of motor pole-pairs. Speed is reported to the ECM as serial data every 10 millisecs. Diagnostic software [FABR ring] calculates the error between the commanded, arbitrated fuel pump speed [FCBR ring] and the FTZM sensed fuel pump speed. The error is filtered and evaluated against calibratable threshold limits to determine pass/fail status. Any failure that exists on the fuel pump output circuit (3 phases) will be manifested in a Fuel Pump Speed	Sensed Filtered Fuel Pump Speed Error	> Speed Error Low Threshold [Supporting Table] **P129F Threshold Low** OR < Speed Error High Threshold [Supporting Table] **P129F Threshold High**	a) Diagnostic Enabled FABR Speed Rationality Diagnostic b) CAN Sensor Bus message $0CB_Available c) FABR Fuel Control Enable Fault Active d) Fuel Pmp Speed Command Alive Rolling Count and Checksum Error [CAN Bus B $0CE] [CFMR_b_FTZM_Cmd1_ARC_ChkErr] e) FABR Fuel Pump Ckt FA f) FABR Driver OverTemp FA g) Run_Crank input Voltage h) Sensor Bus Relay On j) CAN Sensor Bus message $0CB Data Fault [CFMR_b_FTZM_Info8_ARC_ChkErr] k) CAN Sensor Bus message $0CB Comm Fault [CFMR_b_FTZM_Info8_UcodeCmFA] l) Fuel Pmp Spd Command ARC and Checksum Comm Fault Code [CFMR_b_FTZM_Cmd1_UcodeCmFA] m) Timer - FABR Rising Edge Diagnostic Delay n) Timer - FABR Falling Edge Diagn Delay	a) == TRUE b) == TRUE c) <> TRUE d) <> TRUE e) <> TRUE f) <> TRUE g) > 11.00 volts h) == TRUE j) <> TRUE k) <> TRUE l) <> TRUE m) > 1.00 seconds n) > 1.00 seconds	1 sample / 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.
		Rationality Diagnostic fault. Reported fuel pump speed data will only be consumed in this same diagnostic.						

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 done by comparing the fuel control enable circuit state [high or low] sensed by the Fuel Tank Zone Module device to the commanded state of the fuel control enable signal from the ECM [in serial data]. When the sensed state does not match the commanded state, the fail counter increments.	Sensed Fuel Control Enable circuit state [Fuel Tank Zone Module device]	<> Fuel Control Enable Active command [serial data]	a) Diagnostic enabled [KeFABR_b_FuelCntrlEnblDiagEnbl] b) Sensor Bus message $0CC Fuel Pump Command Message Signal Counter Incorrect [CFMR_b_FTZM_Info2_ARC_ChkErr] c) CAN Sensor Bus message $0CC_Available d) Sensor Bus Relay On e) Timer [FABR_t_RunCrankActive]	a) == TRUE b) <> TRUE c) == TRUE d) == TRUE e) >= 0.51 seconds	40.00 failures / 80.00 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 Module (Fuel Tank Zone Module) Control Signal Message Counter Incorrect	P12A8	This DTC monitors for an error in communication with the Fuel Pump Control Module (FTZM) Control Signal Message	Communication of the Alive Rolling Count or Protection Value from the Fuel Pump Control Module (FTZM) over CAN bus is incorrect for out of total samples	 >= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Run/ Start Voltage Signal Message Counter Incorrect	P130F	This DTC monitors for an error in the Ignition Run/Start Voltage Signal Message Counter	Communication of the Alive Rolling Count or Protection Value from the Fuel Pump Control Module (FTZM) over CAN bus is incorrect for out of total samples	 >= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Torque Solver Performance	P134C	The performance of internal control module torque solver is monitored by the iteration number required to complete the computation as well as comparison of the values determined by the solver against constraints. The torque solver performance is monitored only if the torque control is enabled.	Reported iteration number exceeds threshold. Internal control module torque solver requires a certain number of iterations to complete the computation. During normal operation, this number should be smaller than a pre-defined threshold. Two cases are considered as failure: 1) the computation is not completed when the iteration number exceeds the threshold. The reported iteration number is set equal to 1+ maximum number of iterations allowed for the torque solver. 2) the computation is not completed before overrunning the control loop. In this case, the reported iteration number is set equal to the sum of the current iteration number and maximum number of iterations allowed for the torque solver.	> refer to **Maximum number of iterations allowed for torque solver** in supporting tables	Diagnostic enabled and Control module resource monitor enabled	= Enabled = Enabled	5.00 failures out of 8.00 samples 25 ms / sample	Type B, 2 Trips
			Reported solution exceeds lower/upper bounds by more than allowed value.	Solution minus lower bound < - 10.00 or	Diagnostic enabled	= Enabled	5.00 failures out of 8.00 samples 25ms / sample	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			If not in Case 1 or Case 3, the solution determined by internal control module torque solver should remain higher or equal to pre-determined lower bound and lower or equal to pre-determined upper bound. Due to the nature of floating point computation in ECM (engine control module), the solution is allowed to exceed its lower/upper bounds by a value determined by the threshold. Exceeding lower/upper bounds by more than allowed value is considered as failure.	Solution plus upper bound > 10.00 .				
			Reported iteration number is negative. The normal range of iteration number that allows the internal control module torque solver to find a solution is between 0 and maximum number of iterations allowed. The reported iteration number becomes negative in the following two cases which are both considered as failure: 1) the torque solver	Reported iteration number < 0.	Diagnostic enabled	= Enabled	1 failure	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			cannot further proceed before finding a solution AND before the iteration number reaches maximum allowed value. In this case, the reported iteration number is set equal to the negative of the current iteration number. 2) the torque solver returns a solution and is not in Case1, but the solution is not accurate due to error accumulation of floating point computation. In this case, the reported iteration number is set equal to the negative of the current iteration number minus the maximum allowed iteration number minus 1.					

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)		
					Case 1: Battery Delay starting at Key-On	5 Engine Revs		
					Case 2: Ignition Run/ Crank Ignition Run/Crank Voltage	> 5.0 volts		
					Case 3: PT Relay PT Relay Voltage	> 11.0 volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Pressure High Control Circuit Low	P13B1	Controller specific output driver circuit diagnoses the oil pump high-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 output and controller ground	Powertrain Relay Voltage Run/Crank Active Cranking State	≥ 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 (Oil Pump Control Circuit Open)

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) > 8.00 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	< 500.00 degC > -12.00 degC <= 66.00 degC >= 72.00 KPa >= 800.00 degC >= 22.00 seconds > **P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit** This Extended Engine run time exit is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details. < 72.00 KPa	Runs once per trip when the cold start emission reduction strategy is active Frequency: 100ms Loop Test completes after 8 seconds of accumulated qualified data.	EWMA Based - Type A, 1 Trips

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					allow time for the actual engine speed and actual final commanded spark to achieve their desired values. Therefore, when the:			
					Gear Shift Delay Timer	> 1.50 seconds		
					the diagnostic will continue the calculation			
					For Manual Transmission vehicles:			
					Clutch Pedal Position	> 88.00 %		
					Clutch Pedal Position	< 16.00 %		
					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.
Fuel Level Sensor A Reference Feedback Range/ Performance [For use on vehicles with FTZM]	P1434	This DTC will detect a fault in Primary fuel tank level sensor 5V reference by comparing DEC ECU commanded signal period and pulse width values against measured period and pulse width reported by the smart device	Reference Voltage 0 Period Error Maximum [Measured Ref V Period - Commanded Ref V Period]	> 25.00 millisec	a] CAN serial data available [$2D7] b] Calibration - Reference Voltage Command Source c] Timer - Reference Voltage Pulse Width Available Synchronization d] Timer - Reference Voltage Period Available Delay e] Diagnostic System Disabled f] FTZM Serial Data Info4 Rolling Counter Check Error g] Reference Voltage Performance 0 Diagnostic Enabled	a] == True b] == ECM c] > 1.25 sec d] > 0.75 sec e] <> True f] <> True g] == TRUE	250 ms / sample	Type B, 2 Trips
			Reference Voltage 0 Pulse Width Error Maximum [Measured Ref V PW - Commanded Ref V PW]	> 1.50 millisec	a] CAN serial data available [$2D7] b] Calibration - Reference Voltage Command Source c] Timer - Reference Voltage Pulse Width Available Synchronization d] Timer - Reference Voltage Period Available Delay e] Diagnostic System Disabled	a] == True b] == ECM c] > 1.25 sec d] > 0.75 sec e] <> True f] <> True g] == TRUE	250 ms / sample 16 Failures / 20 Samples	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					f] FTZM Serial Data Info4 Rolling Counter Check Error g] Reference Voltage Performance 0 Diagnostic Enabled			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump On Speed Performance	P1467	Purge pump speed does not match requested pump speed when pump is commanded on	Purge pump speed Purge pump speed	> refer to **Purge pump speed on value too high** in Supporting Tables. Calibration threshold for pump speed too high as func of pump supply voltage < refer to **Purge pump speed on value too low** in Supporting Tables. Calibration threshold for pump speed too low as func of pump supply voltage	Propulsion system on Purge pump commanded on LIN data available for Outside Air Temp Powertrain relay voltage Barometric pressure Time delay Purge Pump Over Temperature Status No active DTCs	 ≥ 2 counts ≥ 4 °C ≥ 11.0 volts ≥ 70 kPa ≥ 6 seconds for purge pump speed to spool up (pump off to on) = False P1469 - Purge Pump Speed OOR Low P146A - Purge Pump Speed OOR High P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High P1490 - Purge Pump Voltage Performance P14A4 - EVAP Purge Pump Temperature Too High LIN Communication Fault Active	50 failures out of 63 samples 100 msec / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						AmbientAirDefault OAT_AmbientSensorFA		
					No pending DTC's	P1469 - Purge Pump Speed OOR Low P146A - Purge Pump Speed OOR High LIN Communication Fault Pending		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Off Speed Performance	P1468	Purge pump speed does not match requested pump speed when pump is commanded off	Absolute value of purge pump speed	> 240 RPM	Propulsion system on Purge pump commanded off LIN data available for Powertrain relay voltage Time delay No active DTCs No pending DTC's	≥ 2 counts ≥ 11.0 volts ≥ 21 seconds for purge pump speed to spool up (pump on to off) P1469 - Purge Pump Speed OOR Low Fault Active P146A - Purge Pump Speed OOR High Fault Active P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High P1490 - Purge Pump Voltage Performance LIN Communication Fault Active P1469 - Purge Pump Speed OOR Low P146A - Purge Pump Speed OOR High LIN Communication Fault Pending	50 failures out of 63 samples 100 msec / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Speed Too Low	P1469	Purge pump speed signal is out of range low	Purge pump speed	< -100 RPM	LIN data available for Powertrain relay voltage No active DTCs No pending DTC's	≥ 2 counts ≥ 11.0 volts P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High P1490 - Purge Pump Voltage Performance LIN Communication Fault Active LIN Communication Fault Pending	50 failures out of 63 samples 100 msec / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Speed Too High	P146A	Purge pump speed signal is out of range high	Purge pump speed	> 55,000 RPM	LIN data available for Powertrain relay voltage No active DTCs No pending DTC's	≥ 2 counts ≥ 11.0 volts P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High P1490 - Purge Pump Voltage Performance LIN Communication Fault Active LIN Communication Fault Pending	50 failures out of 63 samples 100 msec / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump System Performance (Continuous Flow Version)	P146B	Purge pump system flow performance, based on pressure sensor feedback, is too low or too high. A purge system, that employs a purge pump, will monitor the purge flow delivery through the evaporative emission system. The estimated purge flow is calculated as a function of pressure across the purge solenoid valve. The failure threshold purge flow is calculated as a function of purge valve duty cycle and barometric pressure. The ratio of the estimated purge flow and failure threshold purge flow is calculated and compared to a threshold. A fault pending is set when the calculated ratio is greater than or less than calibration thresholds. These fault pending states are processed by X out of Y logic.	Purge pump flow ratio low Purge pump flow ratio low = estimated purge flow as a function of pressure across purge solenoid valve / failure threshold for purge low flow as a function of purge valve duty cycle and barometric pressure Purge pump flow ratio high Purge pump flow ratio high = estimated purge flow as a function of pressure across purge solenoid valve / failure threshold for purge high flow as a function of purge valve duty cycle and barometric pressure	< refer to **Purge pump performance low flow ratio threshold** in Supporting Tables. Calibration threshold for performance too low as func of purge valve duty cycle and barometric pressue > refer to **Purge pump performance high flow ratio threshold** in Supporting Tables. Calibration threshold for performance too high as func of purge valve duty cycle and barometric pressure	Propulsion system on Conditions for Estimated Ambient Temperature Using OAT Sensor to be Valid (read description for details) Outside Air Temperature Outside Air Temperature Barometric Pressure Pump speed on timer No device control Averaging of pump pressure sensor reading is valid Purge is enabled EVAP diagnostics are not running (This means purge valve leak (P0496), large leak (P0455), and canister vent restriction (P0446) diagnostics have completed or did not need to run) and delay timer LIN data available for LIN IAT data available Powertrain relay voltage ***************************** When entering or re-	= TRUE > 4 °C < 50 °C ≥ 70 kPa ≥ 6 seconds = TRUE = TRUE > 5.0 Seconds ≥ 2 counts ≥ 11.0 volts *****************************	80 failures out of 100 samples 100 msec / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					entering the enable criteria in this section a delay timer needs to expire	> 1.0 Seconds		
					Engine RPM to enable	450 RPM ≤X≤ 6,750 RPM		
					Engine RPM to remain enabled	350 RPM ≤X≤ 6,850 RPM		
					Engine airlow to enable	5 g/s ≤X≤ 85 g/s		
					Engine airlow to remain enabled	-5 g/s ≤X≤ 95 g/s		
					Purge solenoid DC to enable	8 ≤X≤ 98 %		
					Purge solenoid DC to remain enabled	2 ≤X≤ 104 %		
					Purge gas flow ratio to enable	**Purge System Low Purge Flow Enable** ≤X≤ **Purge System High Purge Flow Enable** in Supporting Tables.		
					Purge gas flow ratio to remain enabled	**Purge System Low Purge Flow Remain Enabled** ≤X≤ **Purge System High Purge Flow Remain Enabled** in Supporting Tables.		
					Purge flow to enable	0.1 ≤X≤ 1.4 g/s		
					Purge flow to remain enabled	-0.1 ≤X≤ 1.6 g/s		
					Induction vacuum to enable	≤ 0.1 kPa		
					Induction vacuum to remain enabled	≤ 0.5 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Vehicle Speed to enable Vehicle Speed to remain enabled IAT to enable IAT to remain enabled Purge DC change per 100 ms loop to enable Purge DC change per 100 ms loop to remain enable ***************************** No active DTCs	≥ 4.3 mph ≥ 1.9 mph 4.0 ≤X≤ 100.00 deg C -1.0 <X< 105.00 deg C X< 5.0 % X< 6.0 % ***************************** P1467 - EVAP Purge Pump On Speed Performance P1469 - Purge Pump Speed OOR Low P146A - Purge Pump Speed OOR High P146D - Purge Pump Pressure Sensor OOR Low P146E - Purge Pump Pressure Sensor OOR High P146F - Purge Pump Pressure Sensor Performance P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					No pending DTC's	P1490 - Purge Pump Voltage Performance P14A4 - EVAP Purge Pump Temperature Too High LIN Communication Fault Active AmbientAirDefault ConvVenting_FA ConvPurgeCkt_FA VehicleSpeedSensor_FA OAT_EstAmbTemp_FA IAT_SensorFA P14A4 - EVAP Purge Pump Temperature Too High LIN Communication Fault Pending IAT_SensorFA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump System Misassembled	P146C	Purge pump pressure is too low for a given pump speed with the purge valve commanded closed. Detects a disconnected hose between the purge pump and purge valve.	Average Purge Pump Pressure Reading – Initial Purge Pump Pressure Reading Readings are averaged for 5 seconds.	< **Purge Pump Misassembled Failure Threshold** * (times) **Purge Pump Diagnostic IAT Multiplier Factor** both in Supporting Tables Calibration threshold (kPa) as a func of (Average Purge Pump Speed and barometric pressure) * IAT multiplier factor (unitless) as a func of IAT	Purge duty cycle is commanded to zero Purge pump commanded on Engine running LIN data available for LIN IAT data available Powertrain relay voltage Barometric pressure Purge pump initial speed Outside Air Temperature Initial average purge pump pressure calculated and in range Outside air temperature No device control Pump spool up time delay Allow test time Purge pump over temperature status Initial pump speed capture period Purge pump speed	≥ 2 counts ≥ 11.0 volts ≥ 70 kPa ≤ 240 RPM 4 °C ≤X≤ 50 °C -3 kPa ≤X≤ 13 kPA ≥ 4 °C (only if pressure sensor is not in the range of -3 kPa ≤X≤ 13 kPA) ≥ 7 seconds ≤ 36 seconds = FALSE ≥ 4 counts ≥ 39,000 RPM	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.
					No active DTCs	P1467 - EVAP Purge Pump On Speed Performance P1469 - Purge Pump Speed OOR Low P146A - Purge Pump Speed OOR High P146D - Purge Pump Pressure Sensor OOR Low P146E - Purge Pump Pressure Sensor OOR High P146F - Purge Pump Pressure Sensor Performance P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High P1490 - Purge Pump Voltage Performance P14A4 - EVAP Purge Pump Temperature Too High LIN Communication Fault Active AmbientAirDefault OAT_AmbientSensorFA ConvPurgeCkt_FA IAT_SensorFA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					No pending DTC's	P1469 - Purge Pump Speed OOR Low P146A - Purge Pump Speed OOR High P146D - Purge Pump Pressure Sensor OOR Low P146E - Purge Pump Pressure Sensor OOR High LIN Communication Fault Pending IAT_SensorFA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Pressure Sensor Circuit Low Voltage	P146D	This DTC will detect a Purge Pump Pressure sensor signal that is too low out of range. The Purge Pump Pressure sensor circuit out of range diagnostic compares the raw sensor % of 5 V ref to a lower threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the sensor % of 5 V ref is below the lower threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported for P146D DTC. A pass is reported for P146D DTC if the low sample counter reaches its threshold.	Purge pump pressure sensor signal The normal operating range of the purge pump pressure sensor is 0.5 volts (~ -6000 Pa) to 4.5 volts (~ 26000 Pa).	< 4.1 % of 5 Vref (0.2 V or -8,361 Pa)			1,280 failures out of 1,600 samples 6.25 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Pressure Sensor Circuit High Voltage	P146E	This DTC will detect a Purge Pump Pressure sensor signal that is too high out of range. The Purge Pump Pressure sensor circuit out of range diagnostic compares the raw sensor % of 5 V ref to a upper threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the sensor % of 5 V ref is above the upper threshold, the high fail counter then increments. If the high fail counter reaches its threshold then a fail is reported for P146E DTC. A pass is reported for P146E DTC if the high sample counter reaches its threshold.	Purge pump pressure sensor signal The normal operating range of the purge pump pressure sensor is 0.5 volts (~ -6000 Pa) to 4.5 volts (~ 26000 Pa).	> 95.9 % of 5 Vref (4.8 V or 28,361 Pa			1,280 failures out of 1,600 samples 6.25 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Pressure Sensor Performance	P146F	Purge pump pressure sensor offset pressure is out of range when sensor re-zero occurs. The DTC will be set if the purge pump pressure sensor offset is out of range when it tries to re-zero at the beginning of a cold start drive cycle. The re-zero test determines if the purge pump pressure sensor signal falls within a calibratable window about atmospheric pressure. The results of the re-zero test are used to determine if there is a re-zero problem. 1) An individual re-zero test generates a re-zero ratio. The ratio goes from 0.0 to 1.0. 2) A 0.0 means that the re-zero pressure signal achieved exactly the previous learned offset. 3) A ratio of 1.0 means that the re-zero pressure did not get within the window. 4) Re-zero pressure within the window generates values between 0.0 and 1.0.	The purge pump pressure sesnor signal is compared to a window about barometric pressure (sensor voltage offset (~1.25 volts)) Upper pressure threshold (pressure addition above the nominal barometric pressure) The learned delta above the previous learned offset needs to be Lower pressure threshold (pressure subtraction below the nominal barometric pressure) The learned delta below the previous learned offset needs to be The difference between purge pump pressure sensor signal and the previous learned offset is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with a EWMA (with 0= perfect pass and 1=perfect fail). When EWMA is the DTC light is	0.96 kPa rezero max < 0.32 kPa delta max -0.96 kPa rezero min > -0.32 kPa delta min > 0.73 (EWMA Fail	Soak timer Power up coolant temperature Barometric pressure Engine not cranking Power up IAT Power up IAT LIN IAT data available Power Up Coolant temp – Power Up IAT temp Average purge pump pressure calculated No Active DTC's No Pending DTC's	≥ 3,600 seconds ≤ 35 °C ≥ 70 kPa ≥ 4 °C ≤ 35 °C ≤ 8 °C P146D - Purge Pump Pressure Sensor OOR Low Fault Active P146E - Purge Pump Pressure Sensor OOR High Fault Active IAT_SensorFA ECT_Sensor_FA EngineModeNotRunTimer_FA AmbientAirDefault P146D - Purge Pump Pressure Sensor OOR Low Fault Active P146E - Purge Pump Pressure Sensor OOR High Fault Active	100 ms	Type A, 1 Trips EWMA Average run length: 6 Run length is 2 trips after code clear

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		The resulting re-zero ratio is filtered using an exponentially weighted moving average (EWMA). When the EWMA exceeds a fail threshold, the purge pump pressure sensor signal re-zero test reports a failure. Once the purge pump pressure sensor signal re-zero test fails, the EWMA fall below a lower re-pass threshold before it can pass the purge pump pressure sensor signal re-zero test again.	illuminated. The DTC light can be turned off if the EWMA is and stays below the EWMA fail threshold for 3 additional consecutive trips.	Threshold), ≤ 0.40 (EWMA Re-Pass Threshold				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Voltage Sensor Circuit Low	P148E	This DTC will detect a purge pump voltage sensor signal that is out of range low (short to ground or open circuit). The purge pump voltage sensor signal out of range diagnostic compares the voltage sensor signal reading to a lower voltage threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the voltage sensor signal reading 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 P148E DTC. A pass is reported for P148E DTC if the low sample counter reaches its threshold.	Purge pump voltage sensor reading	< 3.5 volts	LIN data available for Powertrain relay voltage No active DTCs Np pending DTC's	≥ 2 counts ≥ 11.0 volts LIN Communication Fault Active LIN Communication Fault Pending	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.
EVAP Purge Pump Voltage Sensor Circuit High	P148F	This DTC will detect a purge pump voltage sensor signal that is out of range high (short to power). The purge pump voltage sensor signal out of range diagnostic compares the voltage sensor signal reading to a upper voltage threshold. It is an X out of Y diagnostic that runs continuously anytime the controller is awake. If the voltage sensor signal reading is above the upper voltage threshold, the low fail counter then increments. If the low fail counter reaches its threshold then a fail is reported for P148F DTC. A pass is reported for P148F DTC if the low sample counter reaches its threshold.	Purge pump voltage sensor reading	> 28.0 volts	LIN data available for Powertrain relay voltage No active DTCs Np pending DTC's	≥ 2 counts ≥ 11.0 volts LIN Communication Fault Active LIN Communication Fault Pending	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.
EVAP Purge Pump Voltage Sensor Performance	P1490	This diagnostic fails when the difference between purge pump voltage sensor reading and powertrain relay voltage reading is too large.	Absolute value of (Purge pump voltage sensor - powertrain relay voltage)	> 2.0 volts	Propulsion system on Powertrain relay voltage Engine not cranking Voltage stabilization delay time after engine crank (> 2 seconds) LIN data available for No Active DTC's No Pending DTC's	≥ 11.0 volts ≥ 2.0 seconds ≥ 2 counts P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High LIN Communication Fault Active P148E - Purge Pump Voltage OOR Low P148F - Purge Pump Voltage OOR High LIN Communication Fault Pending	80 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.
Engine Coolant Temperature Sensor 2 Not Plausible	P149A	This DTC detects either a biased high or low temperature sensor. This is done by comparing this sensor with two other temperature sensors.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr2 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6 The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location associated with the		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr - BiasChk_EGR_DwnStmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_TS2_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA EGRTempSensorDNSS_FA	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.
			physical (Temperature) sensor number. **Bypass Inlet:** CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Engine Block:** CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B: **Engine Inlet:** CeEECR_e_PhysSnsr2 Comparison sensor 1: CeEECR_e_BiasChkManfldAirSnsr	 20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis **Bypass Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Engine Block:** Propulsion Off Soak Time Ambient Air Temperature **Engine Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Head Coolant:** Propulsion Off Soak Time Ambient Air Temperature **Heater Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Heater Outlet:** Propulsion Off Soak Time Ambient Air Temperature **Radiator Outlet:** Propulsion Off Soak Time Ambient Air Temperature =================	LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Comparison sensor 2:		Comparison sensor 1 & 2			
			CeEECR_e_BiasChkEng		are not	=		
			OutClntSnsr			CeEECR_e_BiasChkNoS		
			Fuel Operated heater:			election		
			CeEECR_e_AuxHeaterN		=================			
			oEffect		Aux Heat Detection			
			Block Heater:					
			CeEECR_e_AuxHeaterN		Aux heat detection can			
			oEffect		only be enabled the			
			Threshold A:	12.44 ºC	following are met:			
			Threshold B:	12.44 ºC				
					No Active DTCs	Same set as listed above		
			Head Coolant:			and		
			CeEECR_e_PhysSnsr6			EngineModeNotRunTimer		
			Comparison sensor 1:			Error		
			CeEECR_e_BiasChkBlo			EngineModeNotRunTimer		
			ckClntSnsr			_FA		
			Comparison sensor 2:			VehicleSpeedSensor_FA		
			CeEECR_e_BiasChkEng					
			OutClntSnsr		At power-up a warm			
			Fuel Operated heater:		sensor and cool sensor			
			CeEECR_e_AuxHeaterN		are compared			
			oEffect		Warm sensor	CeAEHR_e_BlkHtrBlock		
			Block Heater:			ClntSnsr		
			CeEECR_e_AuxHeaterBi		Cool sensor	CeAEHR_e_BlkHtrRadO		
			asBoth			utClntSnsr		
			Threshold A:	20.03 ºC				
			Threshold B:	8.69 ºC	If the warm sensor is	> 7.40 ºC		
					compared to the cool			
			Heater Inlet:		sensor			
			CeEECR_e_PhysSnsr4					
			Comparison sensor 1:		Propulsion Off Soak Time	> 21,600 seconds		
			CeEECR_e_BiasChkEng		Engine Off Soak Time	> 21,600 seconds		
			OutClntSnsr		Ambient Air Temperature	> -20.00 ºC		
			Comparison sensor 2:					
			CeEECR_e_BiasChkBlo		There are 4 different			
			ckClntSnsr		types of aux heater			
			Fuel Operated heater:		detection for this			
			CeEECR_e_AuxHeaterN		application:			
			oEffect					
			Block Heater:		2x2 signature	Enabled		
					Absolute Drop	Enabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_AuxHeaterBi asBoth Threshold A: Threshold B: **Heater Outlet:** CeEECR_e_PhysSnsr5 Comparison sensor 1: CeEECR_e_BiasChkHtr CrInClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEng OutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect Block Heater: CeEECR_e_AuxHeaterBi asLow Threshold A: Threshold B: **Radiator Outlet:** CeEECR_e_PhysSnsr3 Comparison sensor 1: CeEECR_e_BiasChkEng InClntSnsr Comparison sensor 2: CeEECR_e_BiasChkMa nfldAirSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect Block Heater: CeEECR_e_AuxHeaterBi asLow Threshold A: Threshold B: A failure will be reported if any of the following conditions are met.	17.82 ºC 7.74 ºC 18.83 ºC 9.84 ºC 19.49 ºC 17.85 ºC	IAT Drop Temperature Derivative **2x2 Signature Criteria:** The warm sensors Sensor 1: Sensor 2: The cool sensors Sensor 1: Sensor 2: A block heater will be detected if the warm sensors are within AND The cool sensors are within AND The delta between the two groups (warm/cold) **Absolute Drop Criteria:** The is monitored for a drop. The drop will be monitored for once coolant flow is AND Flow time is between AND Engine runtime is A block heater is detected if a drop is **IAT Drop Criteria:**	Disabled Disabled CeAEHR_e_BlkHtrCylHd ClntSnsr CeAEHR_e_BlkHtrHtrCrI nClntSnsr CeAEHR_e_BlkHtrRadO utClntSnsr CeAEHR_e_BlkHtrOutsid eAirSnsr 5.0 ºC 5.0 ºC > 16.0 ºC CeAEHR_e_BlkHtrBlock ClntSnsr > 87.00 L/min 0.1 - 17.0 seconds < 77.0 seconds > 1.8 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Evaluated in order: 1) This sensor is above both comparison sensors	>A ºC	A block heater will be detected if: IAT has a drop of during a drive defined by: Drive time Vehicle speed	 ≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph		
			2) This sensor is below both comparison sensors	>A ºC	Addtional drive time is provided when vehicle speed drops below above threshold as follows	0.5 times the seconds with vehicle speed below the threshold above		
			3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew	>B ºC	This detection method will abort if the engine is off OR Engine runtime	> 180.0 seconds > 1,800 seconds		
			4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	>B ºC	**Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will increment if derivative is If counts are a block heater is detected ================	 CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds < -0.10 ºC/sec ≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 3 Not Plausible	P149B	This DTC detects either a biased high or low temperature sensor. This is done by comparing this sensor with two other temperature sensors.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr3 Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location associated with the		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr - BiasChk_EGR_DwnStmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_TS3_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA EGRTempSensorDNSS_FA	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.
			physical (Temperature) sensor number. **Bypass Inlet:** CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Engine Block:** CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B: **Engine Inlet:** CeEECR_e_PhysSnsr2 Comparison sensor 1: CeEECR_e_BiasChkManfldAirSnsr	20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis Bypass Inlet: Propulsion Off Soak Time Ambient Air Temperature Engine Block: Propulsion Off Soak Time Ambient Air Temperature Engine Inlet: Propulsion Off Soak Time Ambient Air Temperature Head Coolant: Propulsion Off Soak Time Ambient Air Temperature Heater Inlet: Propulsion Off Soak Time Ambient Air Temperature Heater Outlet: Propulsion Off Soak Time Ambient Air Temperature Radiator Outlet: Propulsion Off Soak Time Ambient Air Temperature =================	LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterNoEffect Threshold A: Threshold B: **Head Coolant:** CeEECR_e_PhysSnsr6 Comparison sensor 1: CeEECR_e_BiasChkBlockClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasBoth Threshold A: Threshold B: **Heater Inlet:** CeEECR_e_PhysSnsr4 Comparison sensor 1: CeEECR_e_BiasChkEngOutClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater:	12.44 ºC 12.44 ºC 20.03 ºC 8.69 ºC	Comparison sensor 1 & 2 are not ================= Aux Heat Detection Aux heat detection can only be enabled the following are met: No Active DTCs At power-up a warm sensor and cool sensor are compared Warm sensor Cool sensor If the warm sensor is compared to the cool sensor Propulsion Off Soak Time Engine Off Soak Time Ambient Air Temperature There are 4 different types of aux heater detection for this application: 2x2 signature Absolute Drop	= CeEECR_e_BiasChkNoSelection Same set as listed above and EngineModeNotRunTimerError EngineModeNotRunTimer_FA VehicleSpeedSensor_FA CeAEHR_e_BlkHtrBlockClntSnsr CeAEHR_e_BlkHtrRadOutClntSnsr > 7.40 ºC > 21,600 seconds > 21,600 seconds > -20.00 ºC Enabled Enabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_AuxHeaterBi		IAT Drop	Disabled		
			asBoth	17.82 ºC	Temperature Derivative	Disabled		
			Threshold A:	7.74 ºC				
			Threshold B:		**2x2 Signature Criteria:**			
					The warm sensors			
			Heater Outlet:		Sensor 1:	CeAEHR_e_BlkHtrCylHd		
			CeEECR_e_PhysSnsr5			ClntSnsr		
			Comparison sensor 1:		Sensor 2:	CeAEHR_e_BlkHtrHtrCrI		
			CeEECR_e_BiasChkHtr			nClntSnsr		
			CrInClntSnsr		The cool sensors			
			Comparison sensor 2:		Sensor 1:	CeAEHR_e_BlkHtrRadO		
			CeEECR_e_BiasChkEng			utClntSnsr		
			OutClntSnsr		Sensor 2:	CeAEHR_e_BlkHtrOutsid		
			Fuel Operated heater:			eAirSnsr		
			CeEECR_e_AuxHeaterN					
			oEffect		A block heater will be			
			Block Heater:		detected if the warm			
			CeEECR_e_AuxHeaterBi		sensors are within	5.0 ºC		
			asLow	18.83 ºC	AND			
			Threshold A:	9.84 ºC	The cool sensors are	5.0 ºC		
			Threshold B:		within			
					AND			
			Radiator Outlet:		The delta between the	> 16.0 ºC		
			CeEECR_e_PhysSnsr3		two groups (warm/cold)			
			Comparison sensor 1:					
			CeEECR_e_BiasChkEng		**Absolute Drop Criteria:**			
			InClntSnsr					
			Comparison sensor 2:					
			CeEECR_e_BiasChkMa		The	CeAEHR_e_BlkHtrBlock		
			nfldAirSnsr		is monitored for a drop.	ClntSnsr		
			Fuel Operated heater:					
			CeEECR_e_AuxHeaterN		The drop will be			
			oEffect		monitored for once			
			Block Heater:		coolant flow is	> 87.00 L/min		
			CeEECR_e_AuxHeaterBi		AND			
			asLow	19.49 ºC	Flow time is between	0.1 - 17.0 seconds		
			Threshold A:	17.85 ºC	AND			
			Threshold B:		Engine runtime is	< 77.0 seconds		
			A failure will be reported if		A block heater is detected			
			any of the following		if a drop is	> 1.8 ºC		
			conditions are met.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Evaluated in order: 1) This sensor is above both comparison sensors 2) This sensor is below both comparison sensors 3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew 4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	>A ºC >A ºC >B ºC >B ºC	**IAT Drop Criteria:** A block heater will be detected if: IAT has a drop of during a drive defined by: Drive time Vehicle speed Addtional drive time is provided when vehicle speed drops below above threshold as follows This detection method will abort if the engine is off OR Engine runtime **Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will increment if derivative is If counts are a block heater is detected ================	≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph 0.5 times the seconds with vehicle speed below the threshold above > 180.0 seconds > 1,800 seconds CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds < -0.10 ºC/sec ≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 4 Not Plausible	P149C	This DTC detects either a biased high or low temperature sensor. This is done by comparing this sensor with two other temperature sensors.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr4 Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location associated with the		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr - BiasChk_EGR_DwnStmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_TS4_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA EGRTempSensorDNSS_FA	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.
			physical (Temperature) sensor number. **Bypass Inlet:** CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Engine Block:** CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B: **Engine Inlet:** CeEECR_e_PhysSnsr2 Comparison sensor 1: CeEECR_e_BiasChkManfldAirSnsr	 20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis **Bypass Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Engine Block:** Propulsion Off Soak Time Ambient Air Temperature **Engine Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Head Coolant:** Propulsion Off Soak Time Ambient Air Temperature **Heater Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Heater Outlet:** Propulsion Off Soak Time Ambient Air Temperature **Radiator Outlet:** Propulsion Off Soak Time Ambient Air Temperature =================	LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterNoEffect Threshold A: Threshold B: **Head Coolant:** CeEECR_e_PhysSnsr6 Comparison sensor 1: CeEECR_e_BiasChkBlockClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasBoth Threshold A: Threshold B: **Heater Inlet:** CeEECR_e_PhysSnsr4 Comparison sensor 1: CeEECR_e_BiasChkEngOutClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater:	12.44 ºC 12.44 ºC 20.03 ºC 8.69 ºC	Comparison sensor 1 & 2 are not ================= Aux Heat Detection Aux heat detection can only be enabled the following are met: No Active DTCs At power-up a warm sensor and cool sensor are compared Warm sensor Cool sensor If the warm sensor is compared to the cool sensor Propulsion Off Soak Time Engine Off Soak Time Ambient Air Temperature There are 4 different types of aux heater detection for this application: 2x2 signature Absolute Drop	= CeEECR_e_BiasChkNoSelection Same set as listed above and EngineModeNotRunTimerError EngineModeNotRunTimer_FA VehicleSpeedSensor_FA CeAEHR_e_BlkHtrBlockClntSnsr CeAEHR_e_BlkHtrRadOutClntSnsr > 7.40 ºC > 21,600 seconds > 21,600 seconds > -20.00 ºC Enabled Enabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_AuxHeaterBiasBoth Threshold A: Threshold B: **Heater Outlet:** CeEECR_e_PhysSnsr5 Comparison sensor 1: CeEECR_e_BiasChkHtrCrInClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Radiator Outlet:** CeEECR_e_PhysSnsr3 Comparison sensor 1: CeEECR_e_BiasChkEngInClntSnsr Comparison sensor 2: CeEECR_e_BiasChkManfldAirSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: A failure will be reported if any of the following conditions are met.	17.82 ºC 7.74 ºC 18.83 ºC 9.84 ºC 19.49 ºC 17.85 ºC	IAT Drop Temperature Derivative **2x2 Signature Criteria:** The warm sensors Sensor 1: Sensor 2: The cool sensors Sensor 1: Sensor 2: A block heater will be detected if the warm sensors are within AND The cool sensors are within AND The delta between the two groups (warm/cold) **Absolute Drop Criteria:** The is monitored for a drop. The drop will be monitored for once coolant flow is AND Flow time is between AND Engine runtime is A block heater is detected if a drop is	Disabled Disabled CeAEHR_e_BlkHtrCylHdClntSnsr CeAEHR_e_BlkHtrHtrCrInClntSnsr CeAEHR_e_BlkHtrRadOutClntSnsr CeAEHR_e_BlkHtrOutsideAirSnsr 5.0 ºC 5.0 ºC > 16.0 ºC CeAEHR_e_BlkHtrBlockClntSnsr > 87.00 L/min 0.1 - 17.0 seconds < 77.0 seconds > 1.8 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Evaluated in order: 1) This sensor is above both comparison sensors 2) This sensor is below both comparison sensors 3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew 4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	>A ºC >A ºC >B ºC >B ºC	**IAT Drop Criteria:** A block heater will be detected if: IAT has adrop of during a drive defined by: Drive time Vehicle speed Addtional drive time is provided when vehicle speed drops below above threshold as follows This detection method will abort if the engine is off OR Engine runtime **Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will increment if derivative is If counts are a block heater is detected ================	≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph 0.5 times the seconds with vehicle speed below the threshold above > 180.0 seconds > 1,800 seconds CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds < -0.10 ºC/sec ≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 5 Not Plausible	P149D	This DTC detects either a biased high or low temperature sensor. This is done by comparing this sensor with two other temperature sensors.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr5 Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location associated with the		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr - BiasChk_EGR_DwnStmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_TS5_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA EGRTempSensorDNSS_FA	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.
			physical (Temperature) sensor number. **Bypass Inlet:** CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Engine Block:** CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B: **Engine Inlet:** CeEECR_e_PhysSnsr2 Comparison sensor 1: CeEECR_e_BiasChkManfldAirSnsr	 20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis **Bypass Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Engine Block:** Propulsion Off Soak Time Ambient Air Temperature **Engine Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Head Coolant:** Propulsion Off Soak Time Ambient Air Temperature **Heater Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Heater Outlet:** Propulsion Off Soak Time Ambient Air Temperature **Radiator Outlet:** Propulsion Off Soak Time Ambient Air Temperature =================	LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Comparison sensor 2:		Comparison sensor 1 & 2			
			CeEECR_e_BiasChkEng		are not	=		
			OutClntSnsr			CeEECR_e_BiasChkNoS		
			Fuel Operated heater:			election		
			CeEECR_e_AuxHeaterN		=================			
			oEffect		Aux Heat Detection			
			Block Heater:					
			CeEECR_e_AuxHeaterN		Aux heat detection can			
			oEffect		only be enabled the			
			Threshold A:	12.44 ºC	following are met:			
			Threshold B:	12.44 ºC				
					No Active DTCs	Same set as listed above		
			Head Coolant:			and		
			CeEECR_e_PhysSnsr6			EngineModeNotRunTimer		
			Comparison sensor 1:			Error		
			CeEECR_e_BiasChkBlo			EngineModeNotRunTimer		
			ckClntSnsr			_FA		
			Comparison sensor 2:			VehicleSpeedSensor_FA		
			CeEECR_e_BiasChkEng					
			OutClntSnsr		At power-up a warm			
			Fuel Operated heater:		sensor and cool sensor			
			CeEECR_e_AuxHeaterN		are compared			
			oEffect		Warm sensor	CeAEHR_e_BlkHtrBlock		
			Block Heater:			ClntSnsr		
			CeEECR_e_AuxHeaterBi		Cool sensor	CeAEHR_e_BlkHtrRadO		
			asBoth			utClntSnsr		
			Threshold A:	20.03 ºC				
			Threshold B:	8.69 ºC	If the warm sensor is	> 7.40 ºC		
					compared to the cool			
			Heater Inlet:		sensor			
			CeEECR_e_PhysSnsr4					
			Comparison sensor 1:		Propulsion Off Soak Time	> 21,600 seconds		
			CeEECR_e_BiasChkEng		Engine Off Soak Time	> 21,600 seconds		
			OutClntSnsr		Ambient Air Temperature	> -20.00 ºC		
			Comparison sensor 2:					
			CeEECR_e_BiasChkBlo		There are 4 different			
			ckClntSnsr		types of aux heater			
			Fuel Operated heater:		detection for this			
			CeEECR_e_AuxHeaterN		application:			
			oEffect					
			Block Heater:		2x2 signature	Enabled		
					Absolute Drop	Enabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_AuxHeaterBi asBoth Threshold A: Threshold B: **Heater Outlet:** CeEECR_e_PhysSnsr5 Comparison sensor 1: CeEECR_e_BiasChkHtr CrInClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEng OutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect Block Heater: CeEECR_e_AuxHeaterBi asLow Threshold A: Threshold B: **Radiator Outlet:** CeEECR_e_PhysSnsr3 Comparison sensor 1: CeEECR_e_BiasChkEng InClntSnsr Comparison sensor 2: CeEECR_e_BiasChkMa nfldAirSnsr Fuel Operated heater: CeEECR_e_AuxHeaterN oEffect Block Heater: CeEECR_e_AuxHeaterBi asLow Threshold A: Threshold B: A failure will be reported if any of the following conditions are met.	17.82 ºC 7.74 ºC 18.83 ºC 9.84 ºC 19.49 ºC 17.85 ºC	IAT Drop Temperature Derivative **2x2 Signature Criteria:** The warm sensors Sensor 1: Sensor 2: The cool sensors Sensor 1: Sensor 2: A block heater will be detected if the warm sensors are within AND The cool sensors are within AND The delta between the two groups (warm/cold) **Absolute Drop Criteria:** The is monitored for a drop. The drop will be monitored for once coolant flow is AND Flow time is between AND Engine runtime is A block heater is detected if a drop is	Disabled Disabled CeAEHR_e_BlkHtrCylHd ClntSnsr CeAEHR_e_BlkHtrHtrCrI nClntSnsr CeAEHR_e_BlkHtrRadO utClntSnsr CeAEHR_e_BlkHtrOutsid eAirSnsr 5.0 ºC 5.0 ºC > 16.0 ºC CeAEHR_e_BlkHtrBlock ClntSnsr > 87.00 L/min 0.1 - 17.0 seconds < 77.0 seconds > 1.8 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Evaluated in order: 1) This sensor is above both comparison sensors 2) This sensor is below both comparison sensors 3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew 4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	>A ºC >A ºC >B ºC >B ºC	**IAT Drop Criteria:** A block heater will be detected if: IAT has a drop of during a drive defined by: Drive time Vehicle speed Addtional drive time is provided when vehicle speed drops below above threshold as follows This detection method will abort if the engine is off OR Engine runtime **Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will increment if derivative is If counts are a block heater is detected ================	≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph 0.5 times the seconds with vehicle speed below the threshold above > 180.0 seconds > 1,800 seconds CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds < -0.10 ºC/sec ≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 6 Not Plausible	P149E	This DTC detects either a biased high or low temperature sensor. This is done by comparing this sensor with two other temperature sensors.	This sensor is compared to two other sensors for this diagnostic to function. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr6 Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The comparison sensors, temperature thresholds, and aux heater effects can be looked up by finding the location associated with the		No Active DTC's Propulsion system Inactive timer error Sensor under diagnosis is not faulted Used comparison sensors are not currently faulted: - BiasChkCylHdClntSnsr - BiasChkBlockClntSnsr - BiasChkEngInClntSnsr - BiasChkEngOutClntSnsr - BiasChkHtrCrInClntSnsr - BiasChkHtrCrOutClnSnsr - BiasChkRadOutClntSnsr - BiasChkBypInClntSnsr - BiasChkEngMetalSnsr - BiasChkIntakeAirSnsr - BiasChkHumTmpSnsr - BiasChkManfldAirSnsr - BiasChkOutsideAirSnsr - BiasChkEngOilSnsr - BiasChk_EGR_UpStrmSnsr - BiasChk_EGR_DwnStmSnsr -	OAT_PtEstFiltFA PSAR_PropSysInactveCrs_FA = FALSE EECR_TS6_CktFA EECR_CylHeadCoolant_CktFA EECR_BlockCoolant_CktFA EECR_EngineInlet_CktFA EECR_EngineOutlet_CktFA EECR_HeaterCoreInlet_CktFA EECR_HeaterCoreOutlet_CktFA EECR_RadiatorOutlet_CktFA EECR_BypassInlet_CktFA EECR_CylHeadMetal1_CktFA IAT_SensorFA HumTempSnsrFA MnfdTempSensorFA OAT_AmbientSensorFA EngOilTempFA EGRTempSensorUPSS_FA EGRTempSensorDNSS_FA	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.
			physical (Temperature) sensor number. **Bypass Inlet:** CeEECR_e_PhysSnsr1 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasLow Threshold A: Threshold B: **Engine Block:** CeEECR_e_PhysSnsr7 Comparison sensor 1: CeEECR_e_BiasChkCylHdClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect Block Heater: CeEECR_e_AuxHeaterBiasHigh Threshold A: Threshold B: **Engine Inlet:** CeEECR_e_PhysSnsr2 Comparison sensor 1: CeEECR_e_BiasChkManfldAirSnsr	 20.73 ºC 8.69 ºC 34.19 ºC 7.67 ºC	BiasChk_EGR_LowPrsSnsr - BiasChkFuelSnsr Comparison sensors ================== The following thresholds are based on the sensor under diagnosis **Bypass Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Engine Block:** Propulsion Off Soak Time Ambient Air Temperature **Engine Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Head Coolant:** Propulsion Off Soak Time Ambient Air Temperature **Heater Inlet:** Propulsion Off Soak Time Ambient Air Temperature **Heater Outlet:** Propulsion Off Soak Time Ambient Air Temperature **Radiator Outlet:** Propulsion Off Soak Time Ambient Air Temperature =================	LPE_TempSnsrFA HRTR_b_FuelSensor_FA_Bndl = Availible ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC ≥ 21,600 seconds ≥ -20.0 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr		Comparison sensor 1 & 2 are not	= CeEECR_e_BiasChkNoSelection		
			Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect		================= Aux Heat Detection			
			Block Heater: CeEECR_e_AuxHeaterNoEffect		Aux heat detection can only be enabled the following are met:			
			Threshold A:	12.44 ºC				
			Threshold B:	12.44 ºC				
					No Active DTCs	Same set as listed above and EngineModeNotRunTimerError EngineModeNotRunTimer_FA VehicleSpeedSensor_FA		
			Head Coolant: CeEECR_e_PhysSnsr6 Comparison sensor 1: CeEECR_e_BiasChkBlockClntSnsr Comparison sensor 2: CeEECR_e_BiasChkEngOutClntSnsr					
			Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect		At power-up a warm sensor and cool sensor are compared			
			Block Heater: CeEECR_e_AuxHeaterBiasBoth		Warm sensor Cool sensor	CeAEHR_e_BlkHtrBlockClntSnsr CeAEHR_e_BlkHtrRadOutClntSnsr		
			Threshold A:	20.03 ºC				
			Threshold B:	8.69 ºC	If the warm sensor is compared to the cool sensor	> 7.40 ºC		
			Heater Inlet: CeEECR_e_PhysSnsr4 Comparison sensor 1: CeEECR_e_BiasChkEngOutClntSnsr		Propulsion Off Soak Time Engine Off Soak Time Ambient Air Temperature	> 21,600 seconds > 21,600 seconds > -20.00 ºC		
			Comparison sensor 2: CeEECR_e_BiasChkBlockClntSnsr Fuel Operated heater: CeEECR_e_AuxHeaterNoEffect		There are 4 different types of aux heater detection for this application:			
			Block Heater:		2x2 signature Absolute Drop	Enabled Enabled		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			CeEECR_e_AuxHeaterBi		IAT Drop	Disabled		
			asBoth	17.82 ºC	Temperature Derivative	Disabled		
			Threshold A:	7.74 ºC				
			Threshold B:		**2x2 Signature Criteria:**			
					The warm sensors			
			Heater Outlet:		Sensor 1:	CeAEHR_e_BlkHtrCylHd		
			CeEECR_e_PhysSnsr5			ClntSnsr		
			Comparison sensor 1:		Sensor 2:	CeAEHR_e_BlkHtrHtrCrI		
			CeEECR_e_BiasChkHtr			nClntSnsr		
			CrInClntSnsr		The cool sensors			
			Comparison sensor 2:		Sensor 1:	CeAEHR_e_BlkHtrRadO		
			CeEECR_e_BiasChkEng			utClntSnsr		
			OutClntSnsr		Sensor 2:	CeAEHR_e_BlkHtrOutsid		
			Fuel Operated heater:			eAirSnsr		
			CeEECR_e_AuxHeaterN					
			oEffect		A block heater will be			
			Block Heater:		detected if the warm			
			CeEECR_e_AuxHeaterBi		sensors are within	5.0 ºC		
			asLow	18.83 ºC	AND			
			Threshold A:	9.84 ºC	The cool sensors are			
			Threshold B:		within	5.0 ºC		
					AND			
			Radiator Outlet:		The delta between the	> 16.0 ºC		
			CeEECR_e_PhysSnsr3		two groups (warm/cold)			
			Comparison sensor 1:					
			CeEECR_e_BiasChkEng		**Absolute Drop Criteria:**			
			InClntSnsr					
			Comparison sensor 2:		The	CeAEHR_e_BlkHtrBlock		
			CeEECR_e_BiasChkMa		is monitored for a drop.	ClntSnsr		
			nfldAirSnsr					
			Fuel Operated heater:		The drop will be			
			CeEECR_e_AuxHeaterN		monitored for once			
			oEffect		coolant flow is	> 87.00 L/min		
			Block Heater:		AND			
			CeEECR_e_AuxHeaterBi		Flow time is between	0.1 - 17.0 seconds		
			asLow	19.49 ºC	AND			
			Threshold A:	17.85 ºC	Engine runtime is	< 77.0 seconds		
			Threshold B:					
					A block heater is detected			
			A failure will be reported if		if a drop is	> 1.8 ºC		
			any of the following					
			conditions are met.		**IAT Drop Criteria:**			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Evaluated in order: 1) This sensor is above both comparison sensors 2) This sensor is below both comparison sensors 3) This sensor is above both comparison sensors and an aux heat source has not been detected to cause this skew 4) This sensor is below both comparison sensors and an aux heat source has not been detected to cause this skew	>A ºC >A ºC >B ºC >B ºC	A block heater will be detected if: IAT has adrop of during a drive defined by: Drive time Vehicle speed Addtional drive time is provided when vehicle speed drops below above threshold as follows This detection method will abort if the engine is off OR Engine runtime **Temperature Derivative Criteria:** Derivative will be monitored using Derivative will be monitored once coolant flow is AND Flow time is between AND Engine runtime is Derivative count will increment if derivative is If counts are a block heater is detected ================	≥ 5.0 ºC ≥ 400.0 seconds ≥ 24.0 kph 0.5 times the seconds with vehicle speed below the threshold above > 180.0 seconds > 1,800 seconds CeAEHR_e_BlkHtrEngOutClntSnsr > -1.00 L/min 5.0 - 15.0 seconds < 75.0 seconds < -0.10 ºC/sec ≥ 4 counts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
EVAP Purge Pump Temperature Too High	P14A4	Purge pump indicates it is too hot to operate and is in a protection mode (shuts down and/ or will not turn on). Diagnostic rationalizes the purge pump too hot status against environmental and vehicle operating conditions.	Purge pump over temperature status AND Intake Air Temperature AND OBD Max Coolant Achieved (read description for details)	= True < 45.0 °C = FALSE	Propulsion system on LIN data available for LIN IAT data available Engine running time Powertrain relay voltage No Active DTC's No Pending DTC's	 ≥ 2 counts ≥ 20 seconds ≥ 11.0 volts IAT_SensorFA ECT_Sensor_FA LIN Communication Fault Active LIN Communication Fault Pending	80 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.
Mass Air Flow Sensor A Signal Message Counter Incorrect	P14B6	This DTC monitors for an error in communication with the Mass Air Flow Sensor A	Communication of the Alive Rolling Count Press_2B_C03 from the Mass Air Flow Sensor A over LIN bus is incorrect for	>= 8.00 counts	Message frame	= Is available	LIN bus communication executes in 500ms loop	Type B, 2 Trips
			out of total samples	>= 10.00 counts	All the following conditions are met for	>= 3,000.00 milliseconds		
			Or		Power Mode	= Run		
			Communication of the Alive Rolling Count TmpHum_2A_C03 from the Mass Air Flow Sensor A over LIN bus is incorrect for	>= 8.00 counts	Powertrain Relay Voltage	>= 11.00 Volts		
			out of total samples	>= 10.00 counts	Run/Crank Ignition Voltage	>= 11.00 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmissio n □ngine Speed Re□uest Circuit	P150C	This DTC monitors for an error in communication with the Transmission □ngine Speed Re□uest signal in □1□D	Communication of the Alive Rolling Count or Protection Value in the Transmission □ngine Speed signal over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	□xecutes in 25ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Throttle Position Steady State Actuation Fault	P1516	Detect an inablity to maintain a steady state throttle position.	The absolute difference between desired and indicated throttle position is >	2.00 percent	Run/Crank voltage 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 For a settling time period Ignition voltage failure is false	> 6.41 Volts < 0.25 percent > 4.00 seconds P1682	0.49 ms	Type B, 2 Trips

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 A over LIN bus is incorrect or the Shutter Module A signals has an internal error for out of total samples	 >= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = 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.
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 B over LIN bus is incorrect or the Shutter Module B signals has an internal error for out of total samples	>= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = 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 "Neutral Default State - When the BCM tells the ECM that the cruise switch “Data Invalid” (latched on/off switch architectures) or “Indeterminate” (mome ntary on/off switch architectures) is detected for too long, the code is set and cruise control is disabled.	cruise switch state is received as "undetermined" for greater than a calibratable time	fail continuously for greater than 3.0 seconds			fail continuously for greater than 3.0 seconds	Type C, No SVS , "Emissio ns Neutral Diagnost ics – special type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Signal Message Counter Incorrect	P155E	This DTC monitors for an error in communication with the DC/DC Converter Actuator Voltage Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Ignition Switch Run/ Start Position Signal Message Counter Incorrect	P156D	This DTC monitors for an error in communication with the DC/DC Converter Run/ Crank Terminal Status Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for out of total samples	 >= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Crank Control Signal Message Counter Incorrect	P156E	This DTC monitors for an error in communication with the DC/DC Converter Crank Control Terminal Signal	Communication of the Alive Rolling Count or Protection Value from the DC/DC Converter over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Bus Relay Feedback Circuit High Voltage	P157A	Detects unexpected CAN activity on the sensor bus. This diagnostic reports the DTC when controller-specific CAN frames are received while the sensor bus relay is commanded "off."	Continued reception of sensor bus CAN frames during driver off state indicates a stuck on circuit failure. Controller specific received CAN frames are selected to determine continued CAN activity.		Sensor Bus Relay feedback circuit high voltage diagnostic enabled Sensor Bus Relay commanded “OFF” No Sensor Bus active DTCs:	= 1 P16D7, P16D8, P16D9	6 failures out of 10 samples 250ms / Sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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 "Neutral Default State - This diagnostic compares the BCM and the ECM configuration calibrations of whether No Cruise, Conventional Cruise Control, or ACC is available on the vehicle. If the calibration for the cruise system type in the ECM does not match the value in $4E9 signal Vehicle Speed Control System Type, a P158A DTC is set and cruise control is disabled."	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 "Emissions Neutral Diagnostics – Special Type C"

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

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Front Object Detection Control Module Torque Request Signal Message Counter Incorrect	P15F6	Detects rolling count or protection value errors in Collision Preparation System Axle Torque Command serial data signal "Neutral Default State - When the ECM determines that a serial communication fault has occurred with the EOCM in frame $2CD, the code is set and the Collision Preparation System is disabled." Only applicable for applications with Full Speed Range Adaptive Cruise Control and Collision Preparation System feature.	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 , "Emissions Neutral Diagnostics – 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 "Neutral Default State - When the ECM determines that a serial communication fault has occurred with the EOCM in frame $2F9, the code is set and the auto braking feature is disabled." Only applicable for applications with Full Speed Range Adaptive Cruise Control and Collision Preparation System feature.	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 , "Emissions Neutral Diagnostics – special type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Sensor Signal Message Counter Incorrect	P15FF	This DTC monitors for an internal error or error in communication with the Battery Monitor Signal	Communication of the Alive Rolling Count from the Battery Monitor Module in frame 1E over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for out of total samples Or Communication of the Alive Rolling Count from the Battery Monitor Module in frame 15 over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for out of total samples Or Communication of the Alive Rolling Count from the Battery Monitor Module in frame 16 over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for out of total samples Or Communication of the Alive Rolling Count from	>= 8.00 counts >= 10.00 counts >= 8.00 counts >= 10.00 counts >= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Fastest periodic communication rate to Battery Monitor Module on LIN bus executes at 250ms.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			the Battery Monitor Module in frame 17 over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for	>= 8.00 counts				
			out of total samples	>= 10.00 counts				
			Or					
			Communication of the Alive Rolling Count from the Battery Monitor Module in frame 18 over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for	>= 8.00 counts				
			out of total samples	>= 10.00 counts				
			Or					
			Communication of the Alive Rolling Count from the Battery Monitor Module in frame 19 over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for	>= 8.00 counts				
			out of total samples	>= 10.00 counts				
			Or					
			Communication of the Alive Rolling Count from the Battery Monitor Module in frame 1D over LIN bus is incorrect or the					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Battery Monitor Module signals it has an internal error for	>= 8.00 counts				
			out of total samples	>= 10.00 counts				
			Or					
			Communication of the Alive Rolling Count from the Battery Monitor Module in frame 1A over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for	>= 8.00 counts				
			out of total samples	>= 10.00 counts				
			Or					
			Communication of the Alive Rolling Count from the Battery Monitor Module in frame 1B over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for	>= 8.00 counts				
			out of total samples	>= 10.00 counts				
			Or					
			Communication of the Alive Rolling Count from the Battery Monitor Module in frame 1C over LIN bus is incorrect or the Battery Monitor Module signals it has an internal error for	>= 8.00 counts				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			out of total samples	>= 10.00 counts				

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	 >= 8.00 Amps <= 0.10 Amps	Battery Voltage Low Side Fuel Pressure 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 detected is true and Manufacturers enable counter is 0) Flex Fuel Sensor Not FA	>= 11 Volts > 0.275 MPa 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.
					Ignition voltage out of correlation error(P1682) not active and Barometric Pressure Inlet Air Temp Fuel Temp	 >= 70.0 KPA >= -12.0 degC -12 <= Temp degC <= 126		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Reference Voltage Status Message Counter Incorrect	P165C	This DTC monitors for an error in communication with the Sensor Reference Voltage Status Signals	Communication of the Alive Rolling Count or Protection Value from the Fuel Control System over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage And Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Voltage Signal Message Counter Incorrect	P167F	This DTC monitors for an error in the FTZM Battery Voltage Signal Message Counter	Communication of the Alive Rolling Count or Protection Value from the Fuel Pump Control Module (FTZM) over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

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

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Bus Relay Control Circuit Open	P16D7	Detects an open circuit in the sensor bus relay circuit. This diagnostic reports the DTC when an open circuit is present. 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 output 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 P16D8 may also set (Sensor Bus Relay Control Circuit Low).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Bus Relay Control Circuit Low	P16D8	Detects a short to ground in the sensor bus relay circuit. This diagnostic reports the DTC when a short to ground is present. 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 output 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 P16D7 may also set (Sensor Bus Relay Control Circuit Open).

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Sensor Bus Relay Control Circuit High	P16D9	Detects a short to power in the sensor bus relay circuit. This diagnostic reports the DTC when a short to power is present. 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 output 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.
Battery Monitor Module Current High	P16DD	This DTC monitors for a battery module current high fault	Battery Module signals a current high fault via LIN bus VeVITR_I_12VBattCurrRaw	> +1400 Amps for 200 fail counts out of 250 sample counts	The diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit	= 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

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

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

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Battery Monitor Module Data Incompatible	P16E3	This DTC monitors for a battery module data incompatible fault	Battery Module data received over LIN bus is incompatible. (Measured by any of the following) Historical Test Absolute value of IBS battery capacity C20 data (IBS Return Nominal C20 - 80.00 Ah) or IBS Returns a battery type that is not equal to or Absolute value of (IBS Return Battery Calibration#1 U40@25 C - 12.11 V) or Absolute value of (IBS Return Battery Calibration#1 U80@25 C - 12.65 V) Continuous Test	Upon IBS wakeup, if any of the below Historical Test conditions are satisfied, the diagnostic fails. > 5.00 Ah CeBSER_e_IBS_Cfg BatAGM > 0.50 Volts > 0.50 Volts If any of the below conditions are satisfied for 16.00 fail counts	The historical mode diagnostic is enabled and / or The continuous mode diagnostic is enabled System Diagnostics Disabled Power Mode 12V System Reference Voltage LIN Bus Off or Battery Module Communication Faults Active Outside Air Temperature Outside Air Temperature Validity Bit IBS Configuration Data Available over LIN bus Historical Test Only Host Controller MEC Counter	= 1 (1 indicates enabled) = 1 (1 indicates enabled) = False Not equal off > 9.00 Volts = False > -20.00 Celsius and < 50.00 Celsius = True = True <= 0	Diagnostic runs in the 250 ms loop	Type B, 2 Trips

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & Temperature Sensor Communication Circuit 3 Low Voltage	P16E4	This DTC determines if the SENT signal shorted low, this is determined by monitoring the number pulses on the SENT signal line received at the ECU and the SENT Signal Line State always indicating low.	The number pulses on the SENT signal line SENT Signal Line State	<= 40 = Low	SENT Sensor Communication Circuit Diagnostic Enabled SENT power up delay	True >= 0.00 seconds Enabled when a code clear is not active or not exiting device control	400 failures out of 500 samples 6.25 ms per sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SENT Fuel Rail Pressure & 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 Sensor Communication Circuit Diagnostic Enabled SENT power up delay	True >= 0.00 seconds Enabled when a code clear is not active or not exiting device control	400 failures out of 500 samples 6.25 ms per sample Continuous	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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	-98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	Type A, 1 Trips
			Absolute difference between Equivance Ratio torque compensation and its dual store out of bounds given by threshold	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of Accessory torque and its redundant calculation is out of bounds given by threshold range	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Absolute difference of Filtered Air-per-cylinder and its redundant calculation is out of bounds given by threshold range	88.27 mg	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference between the previous Final Advance and the current Final Advance not Adjusted for Equivalence Ratio is out of bounds given by threshold range	15.00 degrees		Engine speed >0rpm	Up/down timer 425 ms continuous, 0.5 down time multipier	
			Torque Learn offset is out of bounds given by threshold range	High Threshold 0.00 Nm Low Threshold 0.00	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
				Nm				
			One step ahead calculation of air-per-cylinder and two step ahead is greater than threshold	80.00 mg		Engine speed > 650 rpm	Up/down timer 441 ms continuous, 0.5 down time multipier	
			Difference between Unmanaged Spark and PACS Spark is greater than threshold	15.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Commanded Predicted Engine Torque and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Zero pedal axle torque is out of bounds given by threshold range	High Threshold 1,083.49 Nm Low Threshold -65,535.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Creep Coast Axle Torque is out of bounds given by threshold range	High Threshold 1,083.49 Nm Low Threshold -65,535.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Absolute difference of Friction torque and its redundant calculation is out of bounds given by threshold range	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Arbitrated Air-Per-Cylinder filter coefficient is out of bounds given by threshold range	High Threshold 1.000 Low Threshold 0.074	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Launch spark is active but the launch spark redundant path indicates it should not be active	N/A		Engine speed < 7,000.00 or 7,200.00 rpm (hysteresis pair)	Up/down timer 141 ms continuous, 0.5 down time multipier	
			Rate limited vehicle speed and its dual store do not equal	N/A		Time since first CAN message with vehicle speed >= 0.500 sec	10 / 20 counts; 25.0msec/count	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Cylinders active greater than commanded	2 cylinders		Engine run flag = TRUE > 2.00 s Number of cylinder events since engine run > 24 No fuel injector faults active	Up/down timer 441 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)** + 98.63 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	97.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Engine Immediate Request Without Motor is greater than its redundant calculation plus threshold	97.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							down time multipier	
			Positive Torque Offset is greater than its redundant calculation plus threshold OR Positive Torque Offset is less than its redundant calculation minus threshold	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Commanded Predicted Engine Request is greater than its redundant calculation plus threshold	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, down time	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Regeneration Brake Assist is not within a specified range	Brake Regen Assist < 0 Nm or Brake Regen Assist > 1,000.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Cylinder Spark Delta Correction exceeds the absolute difference as compared to Unadjusted Cylinder Spark Delta	15.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			1. Cylinder Torque Offset exceeds step size threshold OR	1. 98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			2. Sum of Cylinder Torque Offset exceeds sum threshold	2. 98.63 Nm				
			Engine Capacity Minimum Immediate Without Motor is greater than its dual store plus threshold	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Engine Capacity Minimum Engine Off is greater than threshold	0 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine Capacity Minimum Engine Immediate Without Motor is greater than threshold	0 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Commanded Immediate Engine Request is greater than its redundant calculation plus threshold	98.63 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 141 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 141 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)** + 98.63 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.
				98.63 Nm				
			Difference between Driver Requested Immediate Torque primary path and its secondary exceeds threshold	1,083.49 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Driver Immediate Request is less than its redundant calculation minus threshold	1,083.49 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Commanded Immediate Request is greater than its redundant calculation plus threshold	1,083.49 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	40.63 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	97.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Engine min capacity above threshold	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 126 ms continuous, 0.5 down time multipier	
			No fast unmanaged retarded spark above the applied spark plus the threshold	15.00 Degree		Engine speed greater than 0rpm	Up/down timer 425 ms continuous, 0.5 down time multipier	
			Absolute difference of adjustment factor based on temperature and its dual store above threshold	2.76 m/s	Ignition State	Accessory, run or crank	Up/down timer 172 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.
			1. Absolute difference of redundant calculated engine speed above threshold	500 RPM		Engine speed greater than 0 RPM	Up/down timer 141 ms continuous, 0.5 down time multipier	
			After throttle blade pressure and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Speed Control's Preditcted Torque Request and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine oil temperature and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 403 ms continuous, 0.5 down time multipier	
			Desired throttle position greater than redundant calculation plus threshold	9.94 percent	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of the rate limited pre-throttle pressure and its redundant calculation greater than threshold	0.06 kpa	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Throttle desired torque above desired torque plus threshold	98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Difference of Final Torque feedback proportional plus integral term and its redundant calculation is out of bounds given by threshold range	High Threshold 98.63 Nm Low Threshold - 98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Difference of torque model coefficients and its redundant calculation is out of bounds given by threshold range	High Threshold 0.0000341 Low Threshold - 0.0000341	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Difference of base friction torque and its redundant calculation is out of bounds given by threshold	High Threshold 98.63 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.
			range	Low Threshold - 98.63 Nm			down time multipier	
			Accessory drive friction torque is out of bounds given by threshold range	High Threshold 98.63 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			AC friction torque is greater than commanded by AC control software or less than threshold limit	High Threshold 40.00 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Difference of Oil temperature delta friction torque and its redundant calculation is out of bounds given by threshold range	High Threshold 98.63 Nm Low Threshold - 98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	
			Generator friction torque is out of bounds given by threshold range	High Threshold 98.63 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	98.63	Ignition State	Accessory, run or crank	Up/down timer	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			between the Supercharger friction torque and its redundant calculation greater than threshold	Nm			475 ms continuous, 0.5 down time multipier	
			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 275.00 Nm Low Threshold -275.00 Nm Rate of change threshold 6.16 Nm/loop		Engine speed >0rpm MAF, MAP and Baro DTCs are false	Up/down timer 1,000 ms continuous, 0.5 down time multipier	
			Torque error compensation is out of bounds given by threshold range	High Threshold 98.63 Nm Low Threshold 0.00	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.
				Nm				
			Delta Torque Baro compensation is out of bounds given by threshold range	High Threshold 7.03 Nm Low Threshold 0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			1. Difference of reserve torque value and its redundant calculation exceed threshold OR 2. Reserve request does not agree with operating conditions or Difference of final predicted torque and its redundant calculation exeed threshold OR	1. 97.63 Nm 2. N/A 3. 97.63 Nm 4. 97.63 Nm	3. & 4.: Ignition State	1. & 2.: Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 98.63 Nm 3. & 4.:	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.
			3. Rate of change of reserve torque exceeds threshold, increasing direction only OR 4. Reserve engine torque above allowable capacity threshold			Accessory, run or crank		
			Engine Vacuum and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of the calculated Intake Manifold Pressure during engine event versus during time event is greater than threshold	Table, f(Desired Engine Torque). See supporting tables: **P16F3_Delta MAP Threshold f(Desired Engine Torque)**		Engine speed >0rpm	Up/down timer 141 ms continuous, 0.5 down time multipier	
			Min. Axle Torque Capacity is greater than threshold	0.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Driver Predicted Request is greater than its redundant calculation plus threshold OR Driver Predicted Request is less than its redundant calculation minus threshold	1,083.49 Nm	Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Cold Delta Friction Torque and its dual store do not match	N/A	Ignition State	Accessory, run or crank	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Predicted torque for zero pedal determination is greater than calculated limit.	Table, f(Oil Temp, RPM). See supporting tables: **Speed Control External Load f(Oil**	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.
				Temp, RPM) + 98.63 Nm			down time multipier	
			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 > 10.00 s	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Difference of minimum spark advance limit and its redundant calculation is out of bounds given by threshold range	15.00 degrees	Ignition State	Accessory, run or crank	Up/down timer 141 ms continuous, 0.5 down time multipier	
			Difference of commanded spark advance and adjusted delivered is out of bounds given by threshold range	15.00 degrees		Engine speed >0rpm	Up/down timer 425 ms continuous, 0.5 down time multipier	
			Absolute difference between Estimated Engine Torque and its dual store are above a threshold	98.63 Nm		Engine speed >0rpm	Up/down timer 475 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Absolute difference between Estimated Engine Torque without reductions due to torque control and its dual store are above a threshold	98.63 Nm		Engine speed >0rpm	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Difference of desired spark advance for managed torque and its redundant calculation is out of bounds given by threshold range	15.00 degrees		Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 98.63 Nm	Up/down timer 441 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	99 Nm		Engine speed >0rpm	Up/down timer 175 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			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 Threshold: 100 ms		Engine speed > 650 rpm	Up/down timer 441 ms continuous, 0.5 down time multipier	
			Rate limited cruise axle torque request and its dual store do not match within a threshold	40.63 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	1. 3.50 % 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.
			2. Absolute difference of Calculated accelerator pedal position compensated for carpet learn and error conditions and its dual store do not equal OR 3. Absolute difference of Calculated accelerator pedal position and its dual store do not equal					
			Commanded axle torque is greater than its redundant calculation by threshold	1,083.49 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.
			Commanded axle torque is less than its redundant calculation by threshold	1,625.23 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 AFM apps only	Up/down timer 141 ms continuous, 0.5 down time multipier	
			AC friction torque is greater than commanded by AC control software	40.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,048 ms continuous, 0.5 down time multipier	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Engine Speed Lores Intake Firing (time based) calculation does not equal its redundant calculation	N/A		Engine speed >0rpm	Up/down timer 175 ms continuous, 0.5 down time multipier	
			Absolute difference of the calculated spark offset for equivalence ratio and its redundant cacluation is greater than a threshold	15.00 degrees		Engine speed >0rpm	Up/down timer 141 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	
			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	15 mm2			Up/down timer 172	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			and its redundant cacluation is greater than a threshold				ms continuous, 0.5 down time multipier	
			Pedal learns and their redundant calculation do not equal		Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Throttle learns and their redundant calculation do not equal		Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Desired Throttle Position and its redundant calculation do not equal		Ignition State	Accessory, run or crank	Up/down timer 475 ms continuous, 0.5 down time multipier	
			Difference between Estimated Engine Torque and Commanded Engine Torque is greater than an offset -OR- Difference between Engine Torque Control Feedback and its redundant feedback calculation are beyond its safety bounds -OR-	98.63 Nm Greater than 98.63 Nm or Lower than 98.63 Nm	Engine State	Running	Up/down timer 200.00 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.
			Immediate Feedback Control is active beyond allowed -OR- Torque Control Solver Failure is active	2.00 seconds				
			Calculated or Commanded Engine to Axle ratio is lower than a threshold -OR- Engine to Axle Offset is greater than a threshold	0.9 98.63 Nm	Ignition State	Accessory, run or crank	Up/down timer 175.00 ms continuous, 0.5 down time multipier	
			Difference between Cruise Arbitration Request and its redundant calcultion exceeds a threshold -OR- Difference between Cruise Accleration Request and its redundant calcultion exceeds a threshold	40.63 Nm 0.05 KPH/Second	Ignition State	Accessory, run or crank	Up/down timer 500.00 ms continuous, 0.5 down time multipier	
			Difference between commanded Engine Torque and its redundant calcultion is greater than a threshold -OR- Difference between commanded Engine	98.63 Nm 65,535.00 Nm	Ignition State	Accessory, run or crank	Up/down timer 2,047.97 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.
			Torque and its redundant calcultion is less than a threshold					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Acceleration Sensor Signal Message Counter Incorrect	P175F	The diagnostic monitor detects an alive rolling count error or checksum error in the CAN frame containing the lateral acceleration signal value and longitudinal acceleration sensor signal value. Emission neutral default state sets lateral longitudinal acceleration signal = 0.0 g.	rolling count value received from EBCM and expected TCM calculated value not equal OR checksum lateral and longitudinal acceleration CAN frame message value error 50 millisecond update rate	= TRUE = TRUE	enable alive rolling count error detection: diagnostic monitor enable lateral and longitudinal acceleration CAN frame message received battery voltage run crank voltage enable checksum error detection: diagnostic monitor enable lateral and longitudinal acceleration CAN frame message received normal CAN battery voltage run crank voltage communication enabled DTCs not fault active	= 1 Boolean = TRUE ≥ 11.0 volts ≥ 11.0 volts = 1 Boolean = TRUE ≥ 11.0 volts ≥ 11.0 volts = TRUE U0073	alive rolling count errors ≥ 54 out of 9 sample counts 50 millisecond update rate checksum error time ≥ 54.00 seconds	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4WD high or 4WD low command not 4wd high or 4WD low ratio	P17D4	The diagnostic monitor compares measured transfer case ratio to the transfer case control module commanded transfer case state. When the measured transfer case gear ratio is 4WD neutral ratio, while, the transfer case control module command state is 4WD high ratio or 4WD low ratio, the DTC is set. The 4WD neutral ratio regions are considered ratios outside the nominal 4WD high and nominal 4WD low ratios. The 4WD ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	transfer case contol module transfer case command state AND measured transfer case ratio is NOT in 4WD low ratio window AND measured transfer case ratio is NOT in 4WD high window AND measured transfer case ratio is NOT in 4WD low ratio window AND measured transfer case ratio is NOT in 4WD high window OR vehicle is stopped: transfer case output shaft speed transmission output shaft speed vehicle stopped secondary parameter thresholds met (measured transfer case ratio = transmission output speed / transfer case output speed)	≠ 4WD neutral 4WD low ratio window ≤ 3.00 ≥ 2.40 4WD high ratio window ≤1.30 ≥ 0.70 ≥ 2.90 ≤ 2.00 ≥ 1.20 ≤ 0.80 ≤ 10.0 RPM ≥ 500.0 RPM	vehicle stopped: transmission output shaft speed engine torque engine speed accelerator pedal position accelerator pedal position brake pedal position transmssion gear is forward gear: transmission output shaft speed engine torque engine speed accelerator pedal position accelerator pedal position brake pedal position transmssion gear is reverse gear: transmission output shaft speed engine torque engine speed accelerator pedal position accelerator pedal position brake pedal position diagnsotic monitor enable PTO active engine power limited DTCs not fault active	≥ 500.0 RPM ≥ 100.0 Nm ≥ 300.0 RPM ≥ 5.0 % hysteresis high NOT ≤ 3.0 % hysteresis low ≤ 100.0 % ≥ 500.0 RPM ≥ -20.0 Nm ≥ 0.0 RPM ≥ 0.0 % hysteresis high NOT ≤ 0.0 % hysteresis low ≤ 100.0 % ≥ 500.0 RPM ≥ 90.0 Nm ≥ 300.0 PRM ≥ 6.0 % hysteresis high NOT ≤ 3.0 % hysteresis low ≤ 100.0 % = 1 Boolean = FALSE = FALSE CrankSensor_FA VehicleSpeedSensor_FA EngineTorqueEstInaccurate P057B, P057C, P057D,	fail time ≥ 10.50 seconds out of sample time ≥ 15.00 seconds update rate 12.5 milliseconds	Type B, 2 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Axle Torque Secondary Signal Message Counter Incorrect	P1899	This DTC monitors for an error in communication with the Axle Torque Secondary Signal	Communication of the Alive Rolling Count or Protection of the Axle Torque Secondary Signal over CAN bus is incorrect for	>= 10.00 counts	Message frame	= Is available	Executes in 10ms loop.	Type B, 2 Trips
			out of total samples	>= 10.00 counts	All the following conditions are met for	>= 3,000.00 milliseconds		
					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.
Four Wheel Drive Range Secondary Signal Message Counter Incorrect	P189A	This DTC monitors for an error in communication with the Four Wheel Drive Range Secondary Signal	Communication of the Alive Rolling Count or Protection of the Four Wheel Drive Range Secondary Signal over CAN bus is incorrect for out of total samples	>= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Park Assistance System Performance	P18CB	Determines if Park assist active bit from EBCM is valid	Speed Error - APA active ($1C6/$1C7) above a vehicle speed threshold OR Initialization Error - APA active ($1C6/$1C7) without an active torque request OR Exit Error - APA transitions to inactive during active torque request above a vehicle speed threshold	> 10.00 APA active boolean transitions from False to True with Torque Intervention = No request APA active boolean transitions from True to False with Torque Intervention <> No request when vehicle speed is > 1.00	Active Communication with EBCM Power Mode Engine Running Status of traction in GMLAN message ($4E9) Run/Crank Active Ignition Voltage	Received serial data = Run = True = Traction Present > 0.50 seconds > 6.41 volts	>= 4 failures out of 10 Performed every 12.5ms >= 4 failures out of 10 Performed every 12.5ms When transition occurs, no number of samples Performed every 12.5ms	Type C, No SVS Emissions Neutral Diagnostic - Type C

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

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

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Post Catalyst Fuel Trim System Too Lean Bank 1	P2096	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 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 lean, the post catalyst O2 integral and proportional offset control is increased (positive % authority). This applies a lean 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 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 >= 29 % for >= 5.0 seconds AND the % Authority metric is approaching the failure threshold. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 25 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	>= 98.0 % >= 50.0 % If the P2096 is actively failing then the Average Integral Offset must be < 98.0 % and the Average Total Offset must be < 50.0 % 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 Ethanol Estimation in Progress 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 >= 0.0 g/s <= 10,000.0 >= 0 kPa <= 256 >= -20 deg. C <= 200 >= -20 deg. C (or OBD Coolant Enable Criteria = TRUE) Not Active Not Active Not Active = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") >= 2.0 seconds Not Present = Not Valid, Green Cat System condition is considered valid until the	Frequency: Continuous Monitoring in 100ms loop. The Integral and Total Offset % Authority metrics are sampled every 100ms and an average is calculated every 35.0 seconds (350 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).				accumulated air flow is greater than 360,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C and airflow is above 22 grams/sec.		
					No Fault Active for:	AmbientAirDefault AIR System FA Ethanol Composition Sensor FA ECT_Sensor_FA EGRValveCircuit_FA EGRValvePerformance_FA IAT_SensorFA CamSensorAnyLocationFA EvapEmissionSystem_FA EvapFlowDuringNonPurge_FA FuelTankPressureSnsrCkt_FA EvapPurgeSolenoidCircuit_FA EvapSmallLeak_FA EvapVentSolenoidCircuit_FA FuelInjectorCircuit_FA MAF_SensorFA MAF_SensorTFTKO MAP_SensorFA MAP_EngineVacuumStatus EngineMisfireDetected_FA A/F Imbalance Bank1 O2S_Bank_1_Sensor_1_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						O2S_Bank_1_Sensor_2_ FA		
					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 Idle Cruise Light Acceleration Heavy Acceleration	250 250 0 250 250		
					(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 Too Rich Bank 1	P2097	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 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 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 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 >= 29 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 25 % for >= 5.0 seconds. This was done to minimize disabling the diagnostic for longer than necessary.	<= -98.0 % <= -50.0 % If the P2097 is actively failing then the Average Integral Offset must be > -98.0 % and the Average Total Offset must be > -50.0 % 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 35.0 seconds (350 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.	Difference between measured throttle position and modeled position, (modeled = MAX (Commanded vs. Commanded Filtered)) > OR Difference between modeled position (modeled = MIN (Commanded vs. Commanded Filtered)) and measured throttle position >	9.94 percent 9.94 percent	TPS minimum learn is not active AND Powertrain Relay Contact1 Fault is FALSE (no P1682 fault) AND Throttle Control is not in Service or DVT control Throttle is being Controlled AND ((Engine Running AND Run/Crank Voltage) OR Run Crank Voltage)	> 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	TPS minimum learn active AND Powertrain Relay Contact1 Fault is FALSE (no P1682 fault) AND Throttle Control is not in Service or DVT control	= 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.
Throttle Return to Default Performance	P2119	Throttle unable to return to default throttle position after de-energizing ETC motor.	(Normalized TPS1 percent Vref > AND Normailzed TPS2 percent Vref > On the main processor) OR (Normalized TPS1 percent Vref < AND Normailzed TPS2 percent Vref < On the main processor)	1.7560 % Vref 1.7590 % Vref 1.4340 % Vref 1.4310 % Vref	Throttle de-energized due to one of the following conditions: Powerup Default Learn OR Default Throttle Authority OR PT Relay Voltage OR Main System Shutdown OR Battery Saver Active OR (Powertrain Relay On AND Run/Crank Active)	= TRUE = TRUE < 5.500 Volts = TRUE = TRUE = FALSE = FALSE	0.4969 s if ETC motor command is STOP (when Default Throttle Authority or Main System Shutdown is causing Throttle de-energize) 5.0000 s if ETC motor command is not STOP	Type C, No SVS

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) >	3.500 % 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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 >= 5 Seconds P062B not FA or TFTK	10.00 failures out of 20.00 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.
Engine Coolant Temperature Sensor 2 Circuit Low	P2184	Circuit Continuity This DTC detects a short to ground in the a temperature sensor signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr2 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 2 Circuit High	P2185	Circuit Continuity This DTC detects a short to high or open in a temperature signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 2 Circuit Intermittent/ Erratic	P2186	Circuit Erratic This DTC detects large step changes in a temperature signal circuit or the temperature 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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr2 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4		No Active DTC's	EECR_TS2_Erratic_TFTKO EECR_TS2_CktHiLo_FA	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. *****************************	 2.5 seconds -60.0 °C 150.0 °C				

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 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	Standard Mode Filtered Ratio Optional Mode Filtered Ratio For this program the Optional Mode is NOT used	> 0.40 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. > 0.50 If the diagnostic has reported a failure on the prior trip, the Optional Mode Filtered Ratio must fall below 0.25 in order to report a pass. This feature prevents the diagnostic from toggling between failing and passing.	System Voltage Fuel Level Engine Coolant Temperature Cumulative engine run time Diagnostic enabled at Idle (regardless of other operating conditions) Engine speed range Engine speed delta during a short term sample period Mass Airflow (MAF) range Cumulative delta MAF during a short term sample period Filtered MAF delta between samples Note: first order lag filter coefficient applied to MAF = 0.050 Air Per Cylinder (APC)	no lower than 11.0 Volts for more than 0.2 seconds > 10.0 % The diagnostic will disregard the fuel level criteria if the fuel sender is faulty. > -20 deg. C (or OBD Coolant Enable Criteria = TRUE) > 0.0 seconds No 1,125 to 3,280 RPM < 250 RPM 8 to 260 g/s < 5 g/s < 1.00 g/s 800 to 1,460 mg/cylinder	Minimum of 1 test per trip, up to 5 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, 7.20 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			APC delta during short term sample period 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 -------------------------------- Electronic Waste Gate (eWG) present If eWG = yes then Waste Gate Position Intrusive eWG Feature If intrusive Waste Gate positin is enabled then the electronic Waste Gate will be commanded to the following range when the other enable conditions have been met. Intrusive Waste Gate Position Min Intrusive Waste Gate Position Max ----------------------------------	< 100 mg/cylinder < 4.00 percent -10 to 55 degrees 0 to 200 percent 0 to 35 degrees 0 to 30 degrees --------------------------------- Yes -5.0 to 105.0 Disabled -5.0 105.0 ---------------------------------	made within 5 minutes of operation. For RSR or FIR, 10 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 his feature. For programs using Active Fuel Management or Multiple Cam profiles a secondary Imbalance Ratio can be calculated while in the secondary operating modes. This secondary ratio is an optional calculation and is labeled as the "Optional Mode Ratio". The Optional Mode Ratio is calculated the same as explained above with the following supporting			Active Fuel Management Firing Fraction if the Optional Mode is enabled (see Malfunction Criteria) Active Fuel Management Firing fraction for Optional Mode calculations Intrusive Firing Fraction during Fast Initial Response or Rapid Step Response If the intrusive Firing Fraction feature is enabled the Active Fuel Management firing fraction will be forced to a value above this threshold when in Fast Initial Response or in Rapid Step Response. -------------------------------- For programs using multi-step cam profiles: High Lift Cam Profile will use: Low Lift Cam Profile will use: Quality Factor (QF) QF calibrations are located in a 17x17 lookup	0.00 to 1.00 0.00 to 1.00 Disabled >= 0.00 -------------------------------- Standard Mode Filtered Ratio Standard Mode Filtered Ratio >= 0.99		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		tables: **P219A Variance Threshold Bank1 Opt Table** , **P219A Normalizer Bank1 Opt Table** , and **P219A Quality Factor Bank1 Opt Table**			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:	>= 0.0 seconds (Please see "**Closed Loop Enable Clarification**" and "**Long Term FT Enable Criteria**" in Supporting Tables)		
					Device Control	Not active		
					AIR pump	Not on		
					CASE learn	Not active		
					EGR	Not intrusive		
					EVAP	Not intrusive		
					Engine Over Speed Protection	Not Active		
					Idle speed control	Normal		
					PTO	Not Active		
					Injector base pulse width	Above min pulse limit		
					O2 learned htr resistance	= Valid (the O2 heater resistance has learned since NVM reset)		
					Rapid Step Response (RSR): RSR will trigger if the Ratio result from the last test is	>= 0.40		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					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:	>= 1.58 0.00 0.00 EngineMisfireDetected_FA MAP_SensorFA MAF_SensorFA ECT_Sensor_FA 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 (single turbo)	P2227	Detects a performance failure in the Barometric Pressure (BARO) sensor, such as when a BARO value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure values in the induction system will have equalized. The BARO sensor value is checked to see if it is within the normal expected atmospheric pressure range. If it is not, then the BARO performance diagnostic will fail. If the BARO sensor value is within the normal expected atmospheric range, then Manifold Pressure (MAP), Turbocharger Boost Pressure and BARO are compared to see if their values are similar. If the MAP and Turbocharger Boost Pressure sensor values are similar, but the BARO value is not similar, then a BARO performance diagnostic will fail. When the engine is	**Engine Running:** Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update OR Difference between Baro Pressure reading and Estimated Baro when distance since last Estimated Baro update	> 15.0 kPa <= 0.06 miles > 20.0 kPa > 0.06 miles	No Active DTCs: The "Engine Running" case of the P2227 monitor does not execute on applications with LIN MAF. The P10BC monitor is executed instead.	AmbPresSnsrCktFA IAT_SensorFA MAF_SensorFA AfterThrottlePressureFA TPS_FA TPS_Performance_FA VehicleSpeedSensor_FA TC_BoostPresSnsrFA	320 failures out of 400 samples 1 sample every 12.5 msec	Type A, 1 Trips
			Engine Not Rotating: Barometric Pressure OR Barometric Pressure OR ABS(Manifold Pressure - Baro Pressure) AND ABS(Turbocharger Boost Pressure - Manifold Pressure) AND ABS(Turbocharger Boost Pressure - Baro Pressure)	< 50.0 kPa > 115.0 kPa > 10.0 kPa <= 10.0 kPa > 10.0 kPa	Time between current ignition cycle and the last time the engine was running Engine is not rotating If application has a LIN MAF: LIN Communications established with MAF No Active DTCs: No Pending DTCs:	> 10.0 seconds EngineModeNotRunTimer Error MAP_SensorCircuitFA AAP_SnsrCktFA AAP2_SnsrCktFA AAP_LIN1_SnsrCktFA MAP_SensorCircuitFP AAP_SnsrCktFP AAP2_SnsrCktFP AAP_LIN1_SnsrCktFP	4 failures out of 5 samples 1 sample every 12.5 msec for applications without LIN MAF 1 sample every 25 msec for applications with LIN MAF	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit Low (applications with LIN MAF)	P2228	Detects an eroneously low value being reported over the LIN serial connection from the BARO sensor. The diagnostic monitors the BARO sensor pressure output and fails the diagnostic when the pressure is too low. The BARO sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure. The BARO pressure value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	BARO Pressure	< 50.0 kPa	LIN Communications established with MAF		160 failures out of 200 samples 1 sample every 25 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit High (applications with LIN MAF)	P2229	Detects an eroneously high value being reported over the LIN serial connection from the BARO sensor. The diagnostic monitors the BARO sensor pressure output and fails the diagnostic when the pressure is too high. The BARO sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure. The BARO pressure value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	BARO Pressure	> 115.0 kPa	LIN Communications established with MAF		160 failures out of 200 samples 1 sample every 25 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure (BARO) Sensor Circuit Intermittent (applications with LIN MAF)	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 25 milliseconds previous)	> 100 kPa 40 consecutive BARO readings	LIN Communications established with MAF		4 failures out of 5 samples Each sample takes 1.0 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Circuit/Open Bank 1 Sensor 1 (For use with WRAF & Gen IV ECM	P2237	This DTC determines if the B1S1 WRAF O2 Sensor Pump Current signal circuit is Open. When enabled, the diagnostic monitors the failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The diagnostic failure counter is incremented based on the fault bit message received from the ASIC. The DTC is set based on fail and sample counters.	B1S1 WRAF ASIC indicates a Open circuit on the Pump Current circuit signal. Open fail counts are accumulated to determine fault status. Note: This ASIC is referred to as ATIC142 (Continental).	The ASIC provides a fault indication when the pumping current circuit pin is open, or pump cell voltage is > 1.2V and reference cell voltage is < 1.2V Note: the fault must exist for previous 2.5 seconds, it is split in two stages, a passive stage of 1.875 seconds and an active stage of 0.625 seconds.	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************* Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) *************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	20 failures out of 24 samples Continuous in 25 milli - second loop	Type B, 2 Trips
			B1S1 WRAF ASIC indicates a Open circuit on the Pump Current circuit signal. Open fail counts are accumulated to determine fault status. This application uses the following type of WRAF sensor: For NGK_ZFAS_U2 For Bosch_LSU_4p9	The ASIC provides a fault indication when the pumping current circuit fails the following criteria; Based on the type of WRAF sensor used; CeWRSG_e_NGK_ZFAS_U2 element resistance > 400 ohms pump cell reference resistance > Nernst	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************* Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) *************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	20 failures out of 24 samples Continuous in 25 milli - second loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Note: This ASIC is referred to as CJ136 (next Gen version of CJ135 from Bosch).	reference resistance Note: the faults must exist for more than 10 msec to qualify for a fail flag.				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Pumping Current Performance Bank 1 (For use with WRAF - E81	P223C	This DTC determines if the WRAF O2 sensor pumping current has an incorrect or out of range value. This DTC will detect open circuit faults to the Pump current, Ref Cell voltage, Ref Ground circuits. When enabled, the diagnostic monitors the pumping current in three different fault regions during DFCO. The individual diagnostic failure counters are incremented based on the diagnostic results in each region. The DTC is set based on any of the three individual fail and sample counters.	Fault condition present when the pump current is in any of the fault regions when this test is enabled during DFCO. Note: This ASIC is referred to as ATIC142 (Continental).	The three pump current fault regions are: A) Pump current > 5.00 ma B) Pump current ≤ 0.30 ma and ≥ - 0.30 ma C) Pump current < -0.10 ma The three fault regions have individual X out of Y calibrations. When the X out of Y is reached in any region this DTC is set.	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) ************************** Test starts when time in DFCO Test stops when time in DFCO	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds ≥ 5.0 seconds > 10.0 seconds	Region A: 128 failures out of 160 samples OR Region B: 128 failures out of 160 samples OR Region C: 128 failures out of 160 samples Sample rate is 25 msec. Test enabled during DFCO.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Reference Resistance Out Of Range Bank 1	P223E	This DTC determines if the WRAF O2 sensor reference cell has an incorrect or out of range resistance value. This test compares the element's resistance (from the WRAF sensor Application-Specific Integrated Circuit (ASIC)) to the expected values for the enabled condition. The element temperature is directly related to the element resistance based on the released sensor element specifications. The diagnostic failure counter is incremented if the element temperature is outside the expected range. This DTC is set based on the fail and sample counters.	Measured Reference cell temperature	< 700 Deg C OR > 1,000.0 Deg C	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************* Heater Warm-up delay Then Delay after WRAF circuit diagnostic delay *************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	128 failures out of 160 samples Sample rate is 25 msec Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Reference Voltage Circuit/Open Bank 1 Sensor 1 (For use with WRAF & Gen IV ECM	P2243	This DTC determines if the B1S1 WRAF O2 Reference Voltage signal circuit is Open. When enabled, the diagnostic monitors the failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The diagnostic failure counter is incremented based on the fault bit message received from the ASIC. The DTC is set based on fail and sample counters.	B1S1 WRAF ASIC indicates a Open circuit on the Reference Voltage circuit signal. Open fail counts are accumulated to determine fault status. Note: This ASIC is referred to as ATIC142 (Continental).	The ASIC provides a fault indication when the reference voltage circuit pin is open, or reference cell voltage is > 1.2V and pump cell voltage is < 1.2V Note: the fault must exist for previous 2.5 seconds, it is split in two stages, a passive stage of 1.875 seconds and an active stage of 0.625 seconds.	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	20 failures out of 24 samples Continuous in 25 milli - second loop	Type B, 2 Trips
			B1S1 WRAF ASIC indicates a Open circuit on the Reference Voltage circuit signal. Open fail counts are accumulated to determine fault status. Note: This ASIC is referred to as CJ136 (next Gen version of CJ135 from Bosch).	The ASIC provides a fault indication when the reference voltage circuit fails the following criteria; |Nernst signal - 0.45| >1.0 volts Note: the faults must exist for more than 10 msec to qualify for a fail flag.	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	20 failures out of 24 samples Continuous in 25 milli - second loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
O2 Sensor Reference Ground Circuit/Open Bank 1 Sensor 1 (For use with WRAF & Gen IV ECM	P2251	This DTC determines if the B1S1 WRAF O2 Reference Ground signal circuit is Open. When enabled, the diagnostic monitors the failure counters it receives from the WRAF Application-Specific Integrated Circuit (ASIC). The diagnostic failure counter is incremented based on the fault bit message received from the ASIC. The DTC is set based on fail and sample counters.	B1S1 WRAF ASIC indicates a Open circuit on the Reference Ground circuit signal. Open fail counts are accumulated to determine fault status. Note: This ASIC is referred to as ATIC142 (Continental).	The ASIC provides a fault indication when the reference ground circuit pin is open, or pump cell voltage is > 1.2V and reference cell voltage is > 1.2V Note: the fault must exist for previous 2.5 seconds, it is split in two stages, a passive stage of 1.875 seconds and an active stage of 0.625 seconds.	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	20 failures out of 24 samples Continuous in 25 milli - second loop	Type B, 2 Trips
			B1S1 WRAF ASIC indicates a Open circuit on the Reference Ground circuit signal. Open fail counts are accumulated to determine fault status. Note: This ASIC is referred to as CJ136 (next Gen version of CJ135 from Bosch).	The ASIC provides a fault indication when the reference ground circuit fails the following criteria; CJ136 H/W detection Note: the faults must exist for more than 10 msec to qualify for a fail flag.	DTC's Not active this key cycle Measure Valid status (ASIC) Controller status (ASIC) Engine Run or Auto stop ************************** Heater Warm-up delay Then WRAF circuit diagnostic delay (since heater Warm-up delay is complete) **************************	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 = Valid = Ready = True = Complete ≥ 20.0 seconds	20 failures out of 24 samples Continuous in 25 milli - second loop	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Turbo/Super Charger Bypass Valve - Mechanical Turbocharger with wastegate. Not supercharger with mechanical compressor	P2261	This DTC indicates the compressor recirculation valve being stuck closed. This diagnostic is active at coast down let off conditions, where an airflow pulsation criteria is used as basis of this diagnostic.	When measuring time accumulated air mass flow derivate boost pressure is high pass filtered with filter frequency ***************************** A failure is detected when Acc. Filtered Air Mass Flow or Acc.Der.Filtered boost pressure	< 0.50 Second, = 10.00 Hz ************************* > 140.00 g/s > 99,999.00 kPa/s	Diagnostic enabled ***************************** Engine speed ***************************** Bypass valve commanded open duty cycle For at least ***************************** Pressure ratio over the compressor relative limit Condition keep true for x seconds extra ***************************** Negative transient -> TRUE Relative boost and Pressure derivate Hysteresis negative transient -> FALSE Relative boost or Pressure derivate ***************************** No Active DTCs:	True ***************************** >= 1,500 rpm ***************************** > 6.00 % >= 0.25 s ***************************** > refer to **P00C4 P2261: Compressor Surge Line** in Supporting Tables 0.80 s ***************************** TRUE >= 35.00 kPa <= -150.00 kPa/s < 0.00 kPa > 10.00 kPa/s ***************************** BSTR_b_TurboBypassCktFA BSTR_b_BoostSnsrFA MAF_SensorFA	7 Failed tests out of 10 tests 25ms/ sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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	< 830 mvolts > 130 grams	No Active DTC's B1S2 DTC's Not active this key cycle System Voltage Learned heater resistance 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 O2S_Bank_ 1_TFTKO O2S_Bank_ 2_TFTKO P013A, P013B, P013E, P013F, P2270 or P2271 > 11.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = Not Valid, Green O2S condition is considered valid until the accumulated air flow is greater than **Multiple DTC Use_Green Sensor Delay Criteria - Limit** for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab. Airflow accumulation is only enabled when airflow	Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						is above 22.0 grams/sec.		
					Low Fuel Condition Only when FuelLevelDataFault	= False = False		
					Pedal position	≤ 4.0 %		
					Engine Airflow	2.0 ≤ gps ≤ 20.0		
					Closed loop integral	0.85 ≤ 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 Estimation in Progress	= Not Active (Please see “**Ethanol Estimation in Progress**” in Supporting Tables).		
					Post fuel cell	= Enabled, refer to **Multiple DTC Use - Block learn cells to enable Post oxygen sensor tests** for additional info.		
					Crankshaft Torque	< 125.0 Nm		
					EGR Intrusive diagnostic	= not active		
					All post sensor heater delays	= not active		
					O2S Heater (post sensor) on Time	≥ 60.0 sec		
					Transmission Temp	≥ -40.0 ºC		
					Predicted Catalyst temp	500 ≤ ºC ≤ 900		
					Fuel State	= DFCO possible		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					=================	==================		
					All of the above met for at least 0.0 seconds, and then check the following			
					Engine Speed to initially enable test	950 ≤ RPM ≤ 2,950		
					Engine Speed range to keep test enabled (after initially enabled)	900 ≤ RPM ≤ 3,050		
					Vehicle Speed to initially enable test	40.4 ≤ MPH ≤ 77.7		
					Vehicle Speed range to keep test enabled (after initially enabled)	35.4 ≤ MPH ≤ 82.0		
					=================			
					All of the above met for at least 1.2 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 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 O2S_Bank_ 1_TFTKO O2S_Bank_ 2_TFTKO P013A, P013B, P013E, P013F or P2270 > 11.0 Volts = Valid (the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's") = 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.
					 Low Fuel Condition Only when FuelLevelDataFault Fuel State DTC's Passed ================== After above conditions are met: DFCO mode is continued (w/o driver initiated pedal input).	is above 22.0 grams/sec. = False = False = DFCO possible = P2270 = P013E = P013A ==================		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor C Circuit Low (applications with LIN MAF)	P227C	Detects an eroneously low value being reported over the LIN serial connection from the BARO C sensor. The diagnostic monitors the BARO C sensor pressure output and fails the diagnostic when the pressure is too low. The BARO C sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure. The BARO C pressure value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	BARO C Pressure	< 50.0 kPa	LIN Communications established with MAF		160 failures out of 200 samples 1 sample every 25 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor C Circuit High (applications with LIN MAF)	P227D	Detects an eroneously high value being reported over the LIN serial connection from the BARO C sensor. The diagnostic monitors the BARO C sensor pressure output and fails the diagnostic when the pressure is too high. The BARO C sensor is a pressure transducer which outputs a voltage proportional to the absolute pressure. The BARO C pressure value is transmitted to the ECM by the MAF sensor using the LIN serial communication protocol.	BARO C Pressure	> 115.0 kPa	LIN Communications established with MAF		160 failures out of 200 samples 1 sample every 25 msec	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Barometric Pressure Sensor C Circuit Intermittent/ Erratic (applications with LIN MAF)	P227E	Detects a noisy or erratic signal in the barometric pressure (BARO) C circuit by monitoring the BARO C sensor and failing the diagnostic when the BARO C signal has a noisier output than is expected. When the value of BARO C 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 C readings. The result of this summation is called a “string length”. Since the BARO C signal is anticipated to be relatively smooth, a string length of a particular magnitude indicates a noisy or erratic BARO C 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 C reading - BARO C reading from 25 milliseconds previous)	> 100 kPa 40 consecutive BARO C readings	LIN Communications established with MAF		4 failures out of 5 samples Each sample takes 1.0 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Pump Performance	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 P2C1F - High Pressure Pump Control (HPC) fail threshold of pressure too low** Mpa (see supporting tables)	High Pressure Pump Performance Diagnostic Enable Battery Voltage Low Side Fuel Pressure 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 false and Device control pump ckt enabled on is false and	True >= 11 Volts > 0.275 MPa Enabled when a code clear is not active or not exiting device control Engine is not cranking	Positive Pressure Error - 10.00 second failures out of 12.50 second samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					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 >= -12.0 degC -12 <=Temp degC <= 126		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Pump Performance	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 P2C20 - High Pressure Pump Control (HPC) fail threshold for pressure too high** Mpa (see supporting tables)	High Pressure Pump Performance Diagnostic Enable	True	Negative Pressure Error - 10.00 second failures out of 12.50 second samples	Type A, 1 Trips
					Battery Voltage	>= 11 Volts		
					Low Side Fuel Pressure	> 0.275 MPa		
					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 and Engine movement	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.
					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 >= -12.0 DegC -12 <= Temp degC <= 126		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #1 CIRCUIT LOW	P2300	Diagnoses Cylinder #1 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	≤ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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.	$\leq$ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	> 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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.	≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	> 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 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	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #3 CIRCUIT High	P2307	Diagnoses Cylinder #3 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	> 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #4 CIRCUIT Low	P2309	Diagnoses Cylinder #4 Ignition Control (EST) output driver circuit for a Short to Ground fault. Controller specific output driver circuit diagnoses the low sided driver for a short to ground failure when the output is powered off by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to ground failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to ground.	$\leq$ 100 Ω impedance between signal and controller ground	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IGNITION CONTROL #4 CIRCUIT High	P2310	Diagnoses Cylinder #4 Ignition Control (EST) output driver circuit for a Short to Power fault	Voltage measurement outside of controller specific acceptable range during driver on state indicates short to power failure. Controller specific output driver circuit voltage thresholds are set to meet the following controller specification for a short to power.	 ≤ 100 Ω impedance between signal and controller power	Engine running Ignition Voltage	 > 11.0 Volts	50 Failures out of 63 Samples 100 msec rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Control Torque Request Circuit	P2544	Determines if the torque request from the TCM is valid	Protect error - Serial Communication message 2's complement not equal ($189/$199) OR Rolling count error - Serial Communication message ($189/$199) rolling count index value OR Range Error - Serial Communication message - ($189/$199) TCM Requested Torque Increase OR Multi-transition error - Trans torque intervention type request change	Message <> two's complement of message Message <> previous message rolling count value + one > 610 Nm Requested torque intervention type toggles from not increasing request to increasing request	Diagnostic Status Power Mode Ignition Voltage Engine Running Run/Crank Active No Serial communication loss to TCM (U0101)	Enabled = Run > 6.41 volts = True > 0.50 Sec No loss of communication	>= 16 failures out of 20 samples. Performed on every received message >= 6 Rolling count errors out of 10 samples. Performed on every received message >= 6 range errors out of 10 samples. Performed on every received message >= 3 multi-transitions out of 5 samples. Performed every 200 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 Hood Switch Performance	P257D	This DTC monitors the hood switch rationality	Hood Switch position is in an invalid position. Type of Switch: CeHSWR_e_Enumerated With an enumerated type switch the hood switch reading is invalid in these ranges With a discrete type switch the hood switch reading is invalid when With a percentage type switch the hood switch reading is invalid in these ranges With a resistance type switch the hood switch reading is invalid in these ranges	 1281 Ohms to 1404 Ohms Hood Switch 1 and Hood Switch 2 are in the same state (States not equal is proper function) 71.50 % to 67.80 % or 45.70 % to 43.40 % or 17.20 % to 14.60 % 6,775.00 Ohms to 3,367.10 Ohms or 1,585.00 Ohms to 1,352.20 Ohms or 310.40 Ohms to 300.00 Ohms	The diagnostic is enabled Enabled when Run/Crank is active only, otherwise Run/Crank is not used as an enable	= 1 (1 indicates enabled) = 1 (1 indicates Run/ Crank active enabled)	80 failed samples within 100 total samples Diagnostic runs in the 12.5 ms loop	Type B, 2 Trips

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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.
O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1 (For use with WRAF & E81 or GenIV ECM	P2626	This DTC determines if the WRAF O2S trim circuit is open. The trim circuit fine tunes the WRAF O2S pump current signal. The diagnostic is an Application-Specific Integrated Circuit (ASIC) intrusive test which runs when the Run/Crank signal changes from False to True. The diagnostic failure counter is incremented if the ASIC test fails and the enable conditions are met. This DTC is set based on the fail and sample counters.	B1S1 Trim circuit Open test. This application uses the following type of WRAF sensor: The ASIC Open trim test detects a fault if the trim circuit resistance is: For NGK_ZFAS_U2 For Bosch_LSU_4p9 Note: This ASIC is referred to as ATIC142 (Continental).	CeWRSG_e_NGK_ZFAS_U2 > 4,644 ohms > 379.5 ohms	DTC's Not active this key cycle Run/Crank Signal WRAF circuit diagnostic delay (since heater Warm-up delay is complete) Fuel Control State Off Stoich Closed Loop DFCO WRAF Pump current	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 changes from false to true ≥ 20.0 seconds = Closed Loop = Not active = Not active ≤ 1.0 ma	1 fail counts out of 1 samples 25 ms / sample Continuous	Type B, 2 Trips
			B1S1 Trim circuit Open test. This application uses the following type of WRAF sensor: The ASIC Open trim test detects a fault if the trim circuit resistance is: For NGK_ZFAS_U2 For Bosch_LSU_4p9 Note: This ASIC is	CeWRSG_e_NGK_ZFAS_U2 < 118 ohms or > 4K ohms <30 ohms or >300 ohms AND Pump current circuit	DTC's Not active this key cycle Run/Crank Signal WRAF circuit diagnostic delay (since heater Warm-up delay is complete) Fuel Control State Off Stoich Closed Loop DFCO WRAF Pump current	WRAF_Bank_1_FA P0135, P0030, P0031, P0032 changes from false to true ≥ 20.0 seconds = Closed Loop = Not active = Not active ≤ 1.0 ma	1 fail counts out of 1 samples 25 ms / sample Continuous	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			referred to as CJ136 (next Gen version of CJ135 from Bosch).	not detected 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: 8 failures out of 40 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 by calculating the difference between the sensed, filtered system [line] pressure versus the ECM-commanded pressure [error calculation]. The calculated error is then compared to calibrated fault threshold tables for a fault decision.	Sensed Filtered Fuel System [line] pressure error	<= Low Threshold [Supporting Table] **P2635 Threshold Low** OR >= High Threshold [Supporting Table] **P2635 Threshold High**	a) Diagnostic enabled [FDBR_b_FSRD] b) Timer Engine Running [FDBR_t_EngModeRunCoarse] c1) Fuel Flow Rate Valid c2) Ambient Air Pressure Value Defaulted c3) FDB_FuelPresSnsrCktFA c4) Reference Voltage Fault Status [DTC P0641] c5) Exhaust AfterTreatment Fuel Injector A Control Circuit Short Low Fault [HCIR_b_GshtFA DTC P20CD] c6) Fuel Pres Sensor Performance Fault Active [DTC P018B] c7) Use Calculated Flow Performance Fault Thresholds [FDBR_b_UseCalcFSRD_FltThrshs] c8) Engine Speed Status Valid c9) FAB_FuelPmpCktFA c10) Fuel Control Enable	a) == TRUE b) >= 30.00 seconds c1) == TRUE c2) <> TRUE c3) <> TRUE c4) <> TRUE c5) <> TRUE c6) <> TRUE c7) <> TRUE c8] == TRUE c9] <> TRUE c10) <> 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.
					Fault Active [DTC P12A6]			
					c11) Fuel Pump Driver Module OverTemp Fault Active [DTC P1255]	c11) <> TRUE		
					c12) Fuel Pump Speed Fault Active [DTC P129F]	c12) <> TRUE		
					c13) CAN Sensor Bus message $0C3 Comm Fault [CFMR_b_FTZM_Info1_UcodeCmFA DTC P165C]	c13) <> TRUE		
					c14) CAN Sensor Bus Fuel Pmp Spd Command ARC and Checksum Comm Fault Code [CFMR_b_FTZM_Cmd1_UcodeCmFA DTC]	c14] <> TRUE		
					c15) Sensor Configuration [FDBR_e_FuelPresSnsrConfig]	c15) == CeFDBR_e_WiredTo_ECM		
					c16) Sensor Bus Relay On	c16) == TRUE		
					d) Emissions Fuel Level Low [Message $3FB]	d) <> TRUE		
					e) Fuel Control Enable	e) == TRUE		
					f) Fuel Pump Control State	f) == NORMAL		
					g) Run_Crank input circuit voltage	g) 11.00 volts <= Run_Crank_V <= 32.00 volts		
					h) High Pres Fuel Pump	h) <> TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Mode Management Enabled j) High Pres Fuel Pump Control Mode k) Instantaneous Fuel Flow [FCBR_dm_InstFuelFlow] m1) Fuel Pmp Speed Command Alive Rolling Count and Checksum Error [CAN Bus B $0CE] [CFMR_b_FTZM_Cmd1_ARC_ChkErr DTC] m2) CAN Sensor Bus message $0C3_Available m3) Fuel Pres Sensor Ref Voltage Status Message Counter Incorrect Alive Rolling Count and Checksum Error [CAN Bus B $0C3] [CFMR_b_FTZM_Info1_ARC_ChkErr DTC] n) Timer - Diagnostic Enable	 j) <> Disabled Mode AND a8b) <> ZeroFlow Mode k) 0.05 grams/sec <= InstFuelFlow <= Max Allowed Flow [Supporting Table] **P2635 Max Fuel Flow** m1) <> TRUE m2) == TRUE m3) <> TRUE n) > 2.00 seconds		

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 output and controller ground	Run/Crank Voltage Remote Vehicle Start is not active	Voltage ≥ 11.00 volts	50 failures out of 63 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 output 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.
Engine Coolant Bypass Valve C Control Circuit/Open	P26B7	Controller specific output driver circuit detects an open circuit in the load circuit for the Engine Coolant Bypass Valve C when the H-Bridge is energized.	Driver reports an open control cirucit condition	= TRUE	Run Crank Ignition in Range	= True	4 seconds out of a 5 seconds window	Type B, 2 Trips
					Engine not cranking	= True		
					Engine Diag System	= Enabled		
					Driver control circuit open status is not	= Indeterminate		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Bypass Valve C Range/ Performance	P26BB	This DTC will detect when the valve cannot achieve the desired position within a calibrated threshold (degrees (angle)) after the Target position has stabilized for a calibratable amount of time or is moving slower than a calibratable rate. A failure of this diagnostic would indicate a slow or stuck part.	Absolute position deviation between target and actual	> 12.0 Degrees	No DTCs Closed Loop position control Soft Closing function Soft Opening function Valve anti-sticking routine Engine Diag System Engine not cranking Run Crank Ignition in Range Engine Outlet Coolant OR OBD Coolant Enable Criteria Ambient Air Temperature	EECR_EngineOutlet_FA VECR_MRV_LoC_FA VECR_MRV_PstnSnsrCkt_FA VECR_MRV_PstnSnsrCkt_TFTKO VECR_MRV_PstnPerf_FA = Active = Inactive = Inactive = Inactive = Enabled = True = True ≥ -20.0 ºC = TRUE ≥ -20.0 ºC	4 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.
Engine Block Coolant Valve Stuck Open	P26C0	This diagnostic detects the performance of the Block Rotary Valve, bounded by the two mechanical endstops. It monitors the difference between raw position feedback and position request. If the enable criteria are met and the position difference exceeds the failed threshold and the raw position feedback reports a value that is above the 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.	Absolute value of the position difference between position request and position feedback AND Coolant Valve Position Feedback	>= 10.00 ° >= 50.00 °	The following shall be satisfied for [12V System Voltage VECR_BRV_PstnFdbk_Av, VECR_BRV_PstnFdbk_Fol, VECR_BRV_CktLo_FP, VECR_BRV_CktHi_FP VECR_BRV_CktLo_FA, VECR_BRV_CktHi_FA PowertrainRelayStateOn_FA, Powertrain Relay Feedback Circuit DTCs P0689, P0690 Powertrain Relay Commanded On Coolant Valve Position Command If Use Engine Block Coolant Temperature is TRUE, then the following shall be used [Engine Block Coolant Enable Temperature] Coolant Valve Calibration Run**	>= 0.10 seconds >= 11.00 V (hystersis disable < 10.00 V) = No Fault Pending = No Fault Active = No Fault Active = True = between -5.00 ° and 115.00 ° = 0.00 >= -19.00 °C (hystersis disable <= -20.00 °C) Has not been triggered for greater than 37.00 seconds	4 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.
					Change in Two Consecutive Coolant Valve Position Command] ** Calibration run is a set of pre-defined valve movements for calibrating the position sensor and learning the position of the endstops.	<= 4.00 ° for more than 1.00 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Block Coolant Valve Stuck Closed	P26C2	This diagnostic detects the performance of the Block Rotary Valve, bounded by the two mechanical endstops. It monitors the difference between raw position feedback and position request. If the enable criteria are met and the position difference exceeds the failed threshold and the raw position feedback reports a value that is below the 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.	Absolute value of the position difference between position request and position feedback AND Coolant Valve Position Feedback	>= 10.00 ° < 50.00 °	The following shall be satisfied for [12V System Voltage VECR_BRV_PstnFdbk_Av VECR_BRV_PstnFdbk_Fol VECR_BRV_CktLo_FP, VECR_BRV_CktHi_FP VECR_BRV_CktLo_FA, VECR_BRV_CktHi_FA PowertrainRelayStateOn_FA , Powertrain Relay Feedback Circuit DTCs P0689, P0690 Powertrain Relay Commanded On Coolant Valve Position Command If Use Engine Block Coolant Temperature is TRUE, then the following shall be used [Engine Block Coolant Enable Temperature] Coolant Valve Calibration Run**	>= 0.10 seconds >= 11.00 V (hystersis disable < 10.00 V) = No Fault Pending = No Fault Active = No Fault Active = True = between -5.00 ° and 115.00 ° = 0.00 >= -19.00 °C (hystersis disable <= -20.00 °C) Has not been triggered for greater than 37.00 seconds		Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Change in Two Consecutive Coolant Valve Position Command] ** Calibration run is a set of pre-defined valve movements for calibrating the position sensor and learning the position of the endstops.	<= 4.00 ° for more than 1.00 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Pump Overspeed	P26CE	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 actual speed is calculated. An overspeed condition is when the commanded speed is less than the component actual speed. The speed difference is filtered and when the difference is less than the overspeed calibrated fault threshold, the diagnostic reports a FAIL. If filtered speed difference does not exceed the overspeed calibrated fault threshold, the diagnostic reports a PASS. The diagnostic will continue to report as long as the enablement criteria are met. There are two different failure criteria as the pump feedback speed is dependent on the system voltage.	Any of the following fail criteria is met: Criteria1: Filtered (Pump Command Speed - Pump Feedback Speed) 12V System Voltage Criteria 2: Filtered (Pump Command Speed - Pump Feedback Speed) 12V System Voltage	**P26CE Pump Overspeed Fail** < **Threshold** (RPM) >= -9,999.00 V **P26CE Pump Overspeed Fail Threshold Low** < **Voltage** (RPM) < -9,999.00 V (See supporting tables for the above threshold values)	Difference in Pump Command Speed from previous data sample to present data sample Any of the following criteria is met: Criteria 1: Calibration to use fault pending is TRUE PECR_EMP_SpeedOORL_FP PECR_EMP_SpeedOORH_FP Criteria 2: Calibration to use fault pending is FALSE Any of the following criteria is met 2a) PECR_EMP_SpeedOORL_FA PECR_EMP_SpeedOORL_TFTKO 2b) PECR_EMP_SpeedOORH_FA PECR_EMP_SpeedOORH_TFTKO All of the following criteria are met for Time Delay: (See "Time Delay" definition below) 12V System Voltage	< 250.00 RPM for >= 3.00 s = 1.00 (1 is TRUE) = Not Active = 1.00 (0 is FALSE) = Not Active = Not Active > 11.00 V (with hysteresis	8 seconds out of a 10 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.
						disable < 10.00 V)		
					PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoI	= Not Active		
					Pump Enable	= True		
					Pump Command Speed in Range	300.00 RPM <= Command Speed <= 6,250.00 RPM		
					Any of the following criteria is met:			
					Criteria 1: Engine inlet coolant temperature check calibration is TRUE	= 0 (1 is TRUE)		
					Criteria 2: a) Engine Inlet Coolant Temperature Sensor DTCs P2184, P2185, P2186, P149A	= Not Fault Active		
					b) Engine Inlet Coolant Temperature	>= -40.00 °C		
					Where: "Time Delay" If all of the following criteria are met:	>= 4.00 s		
					a) Engine inlet coolant temperature check calibration is FALSE	= 0 (0 is FALSE)		
					b) Engine Inlet Coolant Temperature	<= -40.00 degC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Else "Time Delay"	>= 4.00 s		

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

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

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4WD high command not 4WD high ratio	P279A	Monitor measured transfer case gear ratio is 4WD low ratio or neutral while the transfer case control module command state is 4WD high. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	transfer case contol module transfer case command state AND measured transfer case ratio is in 4WD low ratio window OR measured transfer case ratio is in neutral window AND measured transfer case ratio is in 4WD low ratio window (measured transfer case ratio = transmission output speed / transfer case output speed) update rate 12.5 milliseconds	= 4WD high 4WD low ratio window ≤ 3.00 ≥ 2.40 neutral ratio window ≥ 1.30 ≤ 0.70 OR ≥ 3.00 ≤ 2.40 4WD low ratio window ≤ 2.90 ≥ 2.50	transmssion gear is forward gear: transmission output shaft speed engine torque engine speed accelerator pedal position brake pedal position transmssion gear is reverse gear: transmission output shaft speed engine torque engine speed accelerator pedal position brake pedal position diagnsotic monitor enable PTO active engine power limited DTCs not fault active	≥ 500.0 RPM ≥ 80.0 Nm ≥ 300.0 RPM ≥ 5.0 % ≤ 100.0 % ≥ 500.0 RPM ≥ 80.0 Nm ≥ 300.0 PRM ≥ 5.0 % ≤ 100.0 % = 1 Boolean = FALSE = FALSE CrankSensor_FA VehicleSpeedSensor_FA EngineTorqueEstInaccura te P057B, P057C, P057D, P057E P17D4, P279B, P279C P0502, P0503, P0722, P0723, P2160, P2161	fail time ≥ 7.00 seconds out of sample time ≥ 10.00 seconds update rate 12.5 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4WD low command not 4WD low ratio	P279B	Monitor measures transfer case gear ratio is 4WD high ratio or neutral while the transfer case control module command state is 4WD low. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	transfer case contol module transfer case command state AND measured transfer case ratio is in 4WD high ratio window OR measured transfer case ratio is in neutral window AND measured transfer case ratio is in 4WD high ratio window (measured transfer case ratio = transmission output speed / transfer case output speed) update rate 12.5 milliseconds	= 4WD low 4WD high ratio window ≤ 1.30 ≥ 0.70 neutral ratio window ≥ 1.30 ≤ 0.70 OR ≥ 3.00 ≤ 2.40 4WD high ratio window ≤ 1.20 ≥ 0.80	transmssion gear is forward gear: transmission output shaft speed engine torque engine speed accelerator pedal position brake pedal position transmssion gear is reverse gear: transmission output shaft speed engine torque engine speed accelerator pedal position brake pedal position diagnsotic monitor enable PTO active engine power limited DTCs not fault active	 ≥ 500.0 RPM ≥ 80.0 Nm ≥ 300.0 RPM ≥ 5.0 % ≤ 100.0 % ≥ 500.0 RPM ≥ 80.0 Nm ≥ 300.0 PRM ≥ 5.0 % ≤ 100.0 % = 1 Boolean = FALSE = FALSE CrankSensor_FA VehicleSpeedSensor_FA EngineTorqueEstInaccurate P057B, P057C, P057D, P057E P17D4, P279A, P279C P0502, P0503, P0722, P0723, P2160, P2161	fail time ≥ 7.00 seconds out of sample time ≥ 10.00 seconds update rate 12.5 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transfer Case Control Module Transfer Case Command State Rationality - 4WD neutral command not 4WD neutral ratio	P279C	Monitor measured transfer case gear ratio is 4WD high ratio or 4WD low ratio while the transfer case control module command state is 4WD neutral. The 4WD measured transfer case ratio is calculated as transmission output shaft speed divided by the transfer case output shaft speed, both speed are measured values based on speed sensors.	transfer case contol module transfer case command state AND measured transfer case ratio is in 4WD low ratio window OR measured transfer case ratio is in 4WD high window AND measured transfer case ratio is in 4WD low ratio window or in 4WD high ratio window (measured transfer case ratio = transmission output speed / transfer case output speed) update rate 12.5 milliseconds	= 4WD neutral 4WD low ratio window ≤ 3.00 ≥ 2.40 4WD high ratio window ≥ 1.30 ≤ 0.70 4WD neutral ratio window ≤ 2.90 ≥ 2.50 OR ≤ 1.20 ≥ 0.80	transmssion gear is forward gear: transmission output shaft speed engine torque engine speed accelerator pedal position brake pedal position transmssion gear is reverse gear: transmission output shaft speed engine torque engine speed accelerator pedal position brake pedal position diagnsotic monitor enable PTO active engine power limited DTCs not fault active	≥ 300.0 RPM ≥ -20.0 Nm ≥ 0.0 RPM ≥ 0.0 % ≤ 100.0 % ≥ 500.0 RPM ≥ 80.0 Nm ≥ 300.0 PRM ≥ 5.0 % ≤ 100.0 % = 1 Boolean = FALSE = FALSE CrankSensor_FA VehicleSpeedSensor_FA EngineTorqueEstInaccurate P057B, P057C, P057D, P057E P17D4, P279A, P279B P0502, P0503, P0722, P0723, P2160, P2161	fail time ≥ 10.50 seconds out of sample time ≥ 15.00 seconds update rate 12.5 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Wastegate Position Sensor "A" Circuit Low	P2AB8	Detects a continuous or intermittent short low or open in eWG position circuit by monitoring the eWG position sensor percent Vref and failing the diagnostic when the eWG percent Vref is too low. This diagnostic only runs when powertrain relay voltage is high enough. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Raw position value	< 5.0 %	Diagnostic enabled ***************************** Powertrain relay voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts *****************************	30 failures out of 38 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Wastegate Position Sensor "A" Circuit High	P2AB9	Detects a continuous or intermittent short high in eWG position circuit by monitoring the eWG position sensor percent Vref and failing the diagnostic when the eWG percent Vref is too high. This diagnostic only runs when powertrain relay voltage is high enough. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Raw position value	> 95.0 %	Diagnostic enabled ***************************** Powertrain relay voltage ***************************** Engine does not crank Diagnostic system not disabled	True ***************************** >= 11.0 Volts *****************************	10 failures out of 12 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 4 Circuit Low	P2AFE	Circuit Continuity This DTC detects a short to ground in the a temperature sensor signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr4 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 4 Circuit High	P2AFF	Circuit Continuity This DTC detects a short to high or open in a temperature signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 1 Injection Pulse Performance	P2B00	Diagnostic to determine if any of the commanded injection pulses for cylinder 1 was not delivered due to the injector pintle/ armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 2 Injection Pulse Performance	P2B01	Diagnostic to determine if any of the commanded injection pulses for cylinder 2 was not delivered due to the injector pintle/ armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 3 Injection Pulse Performance	P2B02	Diagnostic to determine if any of the commanded injection pulses for cylinder 3 was not delivered due to the injector pintle/ armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cylinder 4 Injection Pulse Performance	P2B03	Diagnostic to determine if any of the commanded injection pulses for cylinder 4 was not delivered due to the injector pintle/ armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Cylinder 1 Injection Pulse Performance	P2B08	Diagnostic to determine if any of the commanded injection pulses for cylinder 1 during catalyst warm up was not delivered due to the injector pintle/armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/ armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Catalyst Warm up enabled (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Cylinder 2 Injection Pulse Performance	P2B09	Diagnostic to determine if any of the commanded injection pulses for cylinder 2 during catalyst warm up was not delivered due to the injector pintle/armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/ armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Catalyst Warm up enabled (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Cylinder 3 Injection Pulse Performance	P2B0A	Diagnostic to determine if any of the commanded injection pulses for cylinder 3 during catalyst warm up was not delivered due to the injector pintle/armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/ armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Catalyst Warm up enabled (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Cylinder 4 Injection Pulse Performance	P2B0B	Diagnostic to determine if any of the commanded injection pulses for cylinder 4 during catalyst warm up was not delivered due to the injector pintle/armature not moving. The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/ armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude Or Measured Voltage feedback converted to Injector Opening Magnitude	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Catalyst Warm up enabled (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True = True	100.00 failures out of 380.00 samples Continuous Cylinder event sample rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 5 Circuit Low	P2B2D	Circuit Continuity This DTC detects a short to ground in the a temperature sensor signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr5 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 5 Circuit High	P2B2E	Circuit Continuity This DTC detects a short to high or open in a temperature signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	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 Profile Actuator 2 Control Circuit Open	P2B33	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 2 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 2 Control Circuit Low Voltage	P2B34	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 2 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 2 Control Circuit High Voltage	P2B35	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 2 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 2 Circuit Open	P2B39	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 2 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	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips
					Ignition switch is in crank or run position			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 2 Circuit Low Voltage	P2B3A	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 2solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 2 Circuit High Voltage	P2B3B	Controller specific output driver circuit diagnoses the Exhasut Camshaft Profile Actuator 2 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 2 Performance	P2B4F	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 2	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 2 Performance	P2B51	An Uninteded pin firing wlithout controller command. Exhaust Camshaft Profile Actuator 2	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 2 Pin Stuck	P2B53	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 2 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Wastegate Position Sensor “A” Circuit Performance	P2B81	Detects a performance failure on the electronic wastegate acutuator system The diagnose will fail if at least one of supervision fails. * Position deviation supervision * Actuator current supervision * Actuator Duty Cycle supervision In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Actuator is in Normal operation Abs(Position Error) for at least	 > 20.0 % > 1.0 sec	Diagnostic enabled ***************************** Engine not in crank mode Engiene is not in cold start conditions Diagnostic system not disabled Device control Component test not active	True *****************************	25 failures out of 30 samples 100ms / sample	Type A, 1 Trips
			Abs(Actuator current) for at least	> 1.0 A > 1.0 sec	Diagnostic enabled ***************************** Engine not in crank mode Engiene is not in cold start conditions Diagnostic system not disabled Device control Component test not active	True *****************************	25 failures out of 30 samples 100ms / sample	
			Abs(Actuator DC) for at least	> 40.0 % DC > 1.0 sec	Diagnostic enabled ***************************** Engine not in crank mode Engiene is not in cold start conditions Diagnostic system not disabled Device control Component test not active	True *****************************	25 failures out of 30 samples 100ms / sample	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Pump Underspeed	P2B85	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 actual speed is calculated. An underspeed condition is when the commanded speed is greater than the component actual speed. The speed difference is filtered and when the difference is greater than the underspeed calibrated fault threshold, the diagnostic reports a FAIL. If filtered speed difference does not exceed the underspeed calibrated fault threshold, the diagnostic reports a PASS. The diagnostic will continue to report as long as the enablement criteria are met. There are two different failure criteria as the pump feedback speed is dependent on the system voltage.	Any of the following fail criteria is met: Criteria1: Filtered (Pump Command Speed - Pump Feedback Speed) 12V System Voltage Criteria 2: Filtered (Pump Command Speed - Pump Feedback Speed) 12V System Voltage	**P2B85 Pump Underspeed Fail** > **Threshold** (RPM) >= -9,999.00 V **P2B85 Pump Underspeed Fail Threshold Low** > **Voltage** (RPM) < -9,999.00 V (See supporting tables for the above threshold values)	Difference in Pump Command Speed from previous data sample to present data sample Any of the following criteria is met: Criteria 1: Calibration to use fault pending is TRUE PECR_EMP_SpeedOORL_FP PECR_EMP_SpeedOORH_FP Criteria 2: Calibration to use fault pending is FALSE Any of the following criteria is met 2a) PECR_EMP_SpeedOORL_FA PECR_EMP_SpeedOORL_TFTKO 2b) PECR_EMP_SpeedOORH_FA PECR_EMP_SpeedOORH_TFTKO All of the following criteria are met for Time Delay (See "Time Delay"	< 250.00 RPM for >= 3.00 s = 1.00 (1 is TRUE) = Not Active = 1.00 (0 is FALSE) = Not Active = Not Active	8 seconds out of a 10 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.
					definition below) 12V System Voltage PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoI Pump Enable Pump Command Speed in Range Any of the following criteria is met: Criteria 1: Engine inlet coolant temperature check calibration is TRUE Criteria 2: a) EECR_EngineInlet_FA b) Engine Inlet Coolant Temperature Where: "Time Delay" If all of the following criteria are met: a) Engine inlet coolant temperature check	 > 11.00 V (with hysteresis disable < 10.00 V) = Not Active = True 300.00 RPM <= Command Speed <= 6,250.00 RPM = 0 (1 is TRUE) = Not Fault Active >= -40.00 °C >= 4.00 s		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					calibration is FALSE b) Engine Inlet Coolant Temperature Else "Time Delay"	= 0 (0 is FALSE) <= -40.00 degC >= 4.00 s		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Wastegate A Position Exceeded Learning Limit	P2B93	This DTC indicates a failure that the close position learning of the electronic waste gate 'A' was not successful. The learned raw close position was out of the boundaries. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	eWG raw position ***************************** OR ***************************** Never learned a valid Close Position and Engine speed	> 85.0 % ************************* ************************* = FALSE > 1000 rpm	Diagnostic enabled when electronic waste gate is present.	True	on event	Type A, 1 Trips
			eWG raw position and eWG Stable condition detected: Position deviation Stable Time	< 55.0 % < 1.00 % > 0.13 sec	Diagnostic enabled when electronic waste gate is present. ***************************** Coolant Temperature ***************************** No DTCs:	True ***************************** >= 80.0 °C *****************************	on event	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Injection Pulse Performance	P2B95	Monitors injector pulses when the cold start emission reduction strategy is active by accumulating and determining the percentage of engine cycles that missed a pulse relative to the total number of pulses when multi pulse is active.	Injector voltage feedback is not able to detect an opening magnitude on any pulse for any cylinder Or Measured Voltage feedback converted to Injector Opening Magnitude on any pulse for any cylinder	=< **P2B96 - Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below) 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, Multi Pulse Strategy Is Enabled and Active Per the following: Engine Speed Accel Position Engine Run Time	= True = True = 0 < 500.00 degC > -12.00 degC <= 66.00 degC >= 72.00 KPa >= 300.00 RPM <= 2,600.00 RPM <= 1.00 Pct < 22 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.
					The Cold Start Emission Reduction strategy must not be exiting. The strategy will exit per the following:			
					Catalyst Temperature AND	>= 800.00 degC		
					Engine Run Time	>= 22.00 seconds		
					OR			
					Engine Run Time	> **P050D_P1400_CatalystLightOffExtendedEngineRunTimeExit** This Extended Engine run time exit table is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details.		
					OR			
					Barometric Pressure	< 72.00 KPa		
					Multi Pulse Strategy will exit per the following:			
					Engine Speed OR	> 2,800.00 RPM		
					Accel Position	> 2.00 Pct		
					Engine Run Time	>= 22 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Mulit Pulse Strategy will also exit if the any of the "Additional Dual Pulse Enabling Criteria" is not satisfied:			
					"Additional Multi 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		
					Injector Flow Test	Not Active		
					General Enable			
					DTC's Not Set:	AcceleratorPedalFailure ECT_Sensor_FA IAT_SensorCircuitFA MnfdTempSensorCktFA CrankSensor_FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						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.
Injection Pulse Performance Global missing pulse diags	P2B96	Diagnostic to determine if any of the commanded injection pulses for any of the cylinders was not delivered due to the injector pintle/armature not moving (total engine based). The detection is based on the voltage flux feedback that occurs in the injector coil from the pintle/armature movement. The voltage feedback is measured in the ECM across the enable & command wires using an analog to digital converter.	Injector voltage feedback is not able to detect an opening magnitude on any pulse for any cylinder Or Measured Voltage feedback converted to Injector Opening Magnitude on any pulse for any cylinder	=< **P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude Misisng Pulse Fail Limit** (See supporting table)	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Ready (See Definition in Supporting Material below)	= True = True	0.25 Second Fail count out of 1.00 seconds Samples 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 Pump Stuck/ Stalled	P2BA2	The purpose of the diagnostic is to detect and report a failure of the component. This diagnostic checks the commanded off state of the pump to ensure that it is not reporting an actual speed that would represent a commanded on state. If the enable criteria are met when the pump is commanded off, the actual speed is evaluated. If the actual speed is greater than the calibrated fault threshold, the diagnostic reports a FAIL. If the actual speed 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 Speed	>= 10.00 RPM	12V System Voltage PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_Fol Any of the following criteria are met for a) Pump Enable b) Pump Command Speed in Range	> 11.00 V (with hysteresis disable < 10.00 V) = Not Active >= 3.00 s = False 0.00 RPM to 4.00 RPM	8 seconds out of a 10 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 4 Circuit Intermittent/ Erratic	P2BB4	Circuit Erratic This DTC detects large step changes in a temperature signal circuit or the temperature 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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr4 Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4		No Active DTC's	EECR_TS4_Erratic_TFTKO EECR_TS4_CktHiLo_FA	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. *****************************	 2.5 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 5 Circuit Intermittent/ Erratic	P2BB5	Circuit Erratic This DTC detects large step changes in a temperature signal circuit or the temperature 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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr5 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4		No Active DTC's	EECR_TS5_Erratic_TFTKO EECR_TS5_CktHiLo_FA	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. *****************************	 2.5 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 6 Circuit Low	P2BB8	Circuit Continuity This DTC detects a short to ground in the a temperature sensor signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr6 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolant TempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolant TempSnsr6	< X Ohms X is equal to: Temp Sensor 1: 55 Ohms Temp Sensor 2: 47.5 Ohms Temp Sensor 3: 41.1 Ohms Temp Sensor 4: 47.5 Ohms Temp Sensor 5: 41.1 Ohms Temp Sensor 6: 47.5 Ohms Temp Sensor 7: 47.5 Ohms			5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 6 Circuit High	P2BB9	Circuit Continuity This DTC detects a short to high or open in a temperature signal circuit or the temperature 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) This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: RadCoolantTempSnsr Temperature Sensor 1: CeEECR_e_EngCoolantTempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolantTempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolantTempSnsr Temperature Sensor 4: CeEECR_e_EngCoolantTempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolantTempSnsr4 Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6	> X Ohms X is equal to: Temp Sensor 1: 174,069 Ohms Temp Sensor 2: 298,262 Ohms Temp Sensor 3: 354,667 Ohms Temp Sensor 4: 298,262 Ohms Temp Sensor 5: 354,667 Ohms Temp Sensor 6: 298,262 Ohms Temp Sensor 7: 298,262 Ohms	Engine run time OR IAT min	> 10.0 seconds ≥ -20.0 °C	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Temperature Sensor 6 Circuit Intermittent/ Erratic	P2BBA	Circuit Erratic This DTC detects large step changes in a temperature signal circuit or the temperature 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.	Temperature step change: 1) postive step change is greater than calculated high limit OR 2) negitive step change is lower than calculated low limit. This program uses a highly confiurable sensor reading system. This DTC is associated with the temp sensor that is equal to: EngCoolantTempSnsr6 Temperature Sensor 1: CeEECR_e_EngCoolant TempSnsr1 Temperature Sensor 2: CeEECR_e_EngCoolant TempSnsr2 Temperature Sensor 3: CeEECR_e_RadCoolant TempSnsr Temperature Sensor 4: CeEECR_e_EngCoolant TempSnsr3 Temperature Sensor 5: CeEECR_e_EngCoolant TempSnsr4		No Active DTC's	EECR_TS6_Erratic_TFTKO EECR_TS6_CktHiLo_FA	5 seconds out of a 6 seconds window	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 6: CeEECR_e_EngCoolantTempSnsr5 Temperature Sensor 7: CeEECR_e_EngCoolantTempSnsr6 The calculated high and low limits for the next reading use the following calibrations: Temperature Sensor 1: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 2: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 3: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 4: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 5: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit Temperature Sensor 6: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit	 3.1 seconds -60.0 °C 150.0 °C 7.4 seconds -60.0 °C 150.0 °C 4.4 seconds -60.0 °C 150.0 °C 5.7 seconds -60.0 °C 150.0 °C 4.5 seconds -60.0 °C 150.0 °C 2.8 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Temperature Sensor 7: 1) Sensor time constant 2) Sensor low limit 3) Sensor high limit *****Generic Example***** If the last temp reading was 90 °C, the Time constant was calibrated at 10 seconds, the low limit was calibrated to -80 °C and the high limit was calibrated to 200 °C the caluculated limits are 101 °C and 73 °C. The next reading (after the 90 °C reading) must be between 73 °C and 101 °C to be valid. *****************************	 2.5 seconds -60.0 °C 150.0 °C				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor A Circuit Bank 1	P2C05	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor A 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor A Range/ Performance Bank 1	P2C06	Intake Hall Sensor 1 position feedback not matching expected	DTC detects shift Pin Position Hall feedback failures If Hall Feedback signal seen but no shift command was sent to actuator. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00)	Pin Hall Feedback registers below 55.00 , then below 45.00 , then above 68.00 ,	System Voltage Engine Running PCODES	> 11.00 Volts = TRUE CrankSensor_FA CrankSensor_TFTKO CamLctnIntFA CamSnsrIntTFTKO CamLctnExhFA CamSnsrExhTFTKO	4.00 samples out of 5.00 reading	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor A Circuit Low Bank 1	P2C07	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor A solenoid 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor A Circuit High Bank 1	P2C08	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor A 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 off Ignition switch is in crank or run position	> 11.00 Volts	4.00 fail reports out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor B Circuit Bank 1	P2C09	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor B 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor B Range/ Performance Bank 1	P2C0A	Intake Hall Sensor 2 position feedback not matching expected	DTC detects shift Pin Position Hall feedback failures If Hall Feedback signal seen but no shift command was sent to actuator. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00)	Pin Hall Feedback registers below 55.00 , then below 45.00 , then above 68.00 ,	System Voltage Engine Running No active P codes	> 11.00 Volts = TRUE CrankSensor_FA CrankSensor_TFTKO CamLctnIntFA CamSnsrIntTFTKO CamLctnExhFA CamSnsrExhTFTKO	4.00 samples out of 5.00 reading	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor B Circuit Low Bank 1	P2C0B	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor B solenoid 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor B Circuit High Bank 1	P2C0C	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor B 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 off Ignition switch is in crank or run position	> 11.00 Volts	4.00 fail reports out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor C Circuit Bank 1	P2C0D	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor C 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor C Range/ Performance Bank 1	P2C0E	Intake Hall Sensor 3 position feedback not matching expected	DTC detects shift Pin Position Hall feedback If Hall Feedback signal seen but no shift command was sent to actuator. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00)	Pin Hall Feedback registers below 55.00 , then below 45.00 , then above 68.00 ,	System Voltage Engine Running No Active P codes	> 11.00 Volts = TRUE CrankSensor_FA CrankSensor_TFTKO CamLctnIntFA CamSnsrIntTFTKO CamLctnExhFA CamSnsrExhTFTKO	4.00 samples out of 5.00 reading	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor C Circuit Low Bank 1	P2C0F	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor C solenoid 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor C Circuit High Bank 1	P2C10	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor C 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 off Ignition switch is in crank or run position	> 11.00 Volts	4.00 fail reports out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor A Circuit Bank 1	P2C12	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator Position Sensor A 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor A Range/ Performance Bank 1	P2C13	Exhaust Hall Sensor 1 position feedback not matching expected	DTC detects shift Pin Position Hall feedback If Hall Feedback signal seen but no shift command was sent to actuator. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00)	Pin Hall Feedback registers below 55.00 , then below 45.00 , then above 68.00 ,	System Voltage Engine Running No Active P Codes	> 11.00 Volts = TRUE CrankSensor_FA CrankSensor_TFTKO CamLctnIntFA CamSnsrIntTFTKO CamLctnExhFA CamSnsrExhTFTKO	4.00 samples out of 5.00 reading	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor A Circuit Low Bank 1	P2C14	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator Position Sensor A solenoid 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	> 11.00 Volts	4.00 failures out of 5.00 samples	Type A, 1 Trips
					Output driver is commanded on			
					Ignition switch is in crank or run position			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor A Circuit High Bank 1	P2C15	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator Position Sensor A 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 off Ignition switch is in crank or run position	> 11.00 Volts	4.00 fail reports out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor B Circuit Bank 1	P2C16	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator Position Sensor B 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor B Range/ Performance Bank 1	P2C17	Exhaust Hall Sensor 2 position feedback not matching expected	DTC detects shift Pin Position Hall feedback failures If Hall Feedback signal seen but no shift command was sent to actuator. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00)	Pin Hall Feedback registers below 55.00 , then below 45.00 , then above 68.00 ,	System Voltage Engine Running No Active P Codes	> 11.00 Volts = TRUE CrankSensor_FA CrankSensor_TFTKO CamLctnIntFA CamSnsrIntTFTKO CamLctnExhFA CamSnsrExhTFTKO	4.00 samples out of 5.00 reading	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor B Circuit Low Bank 1	P2C18	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator Position Sensor B solenoid 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Actuator Position Sensor B Circuit High Bank 1	P2C19	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator Position Sensor B 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 off Ignition switch is in crank or run position	> 11.00 Volts	4.00 fail reports out of 5.00 samples	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 SIDI High Pressure Pump min/ max authority During Catalyst Warm Up	P2C1E	This DTC determines when the high pressure pump control has reached to its max or min authority during Cataylst Warm up	High Pressure Fuel Pump Delivery Angle OR High Pressure Fuel Pump Delivery Angle	>= 92 ° <= 0 °	Catalyst Warm Up High Pressure Pump Performance Diagnostic Enable Battery Voltage Low Side Fuel Pressure Barometric Pressure Inlet Air Temp Fuel Temp Catalyst Warm up enabled (See Definition in Supporting Material below) 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	True >= 11 Volts > 0.275 MPa Enabled when a code clear is not active or not exiting device control Engine is not cranking >= 70.0 KPA >= -12.0 degC -12 <= Temp degC <= 126 = True	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.
					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 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.
SIDI High Pressure Pump Performance During Catalyst Warm Up	P2C1F	This DTC determines if the high pressure pump is not able to maintain target pressure Catalyst Warm Up. 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 P2C1F - High Pressure Pump Control (HPC) fail threshold of pressure too low** Mpa (see supporting tables)	Catalyst Warm Up 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	> 0.275 MPa		
					Catalyst Warm up enabled (See Definition in Supporting Material below)	= True		
					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	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.
					Device control commanded pressure is 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 >= -12.0 degC -12 <=Temp degC <= 126		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
SIDI High Pressure Pump Performance During Catalyst Warm Up	P2C20	This DTC determines if the high pressure pump is delivering high pressure that desired pressure Catalyst Warm Up. 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 P2C20 - High Pressure Pump Control (HPC) fail threshold for pressure too high** Mpa (see supporting tables)	Catalyst Warm Up High Pressure Pump Performance Diagnostic Enable	True	Negative Pressure Error - 10.00 second failures out of 12.50 second samples	Type A, 1 Trips
					Battery Voltage	>= 11 Volts		
					Low Side Fuel Pressure	> 0.275 MPa		
					Catalyst Warm up enabled (See Definition in Supporting Material below)	= True		
					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	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.
					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 Barometric Pressure Inlet Air Temp Fuel Temp	 >= 70.0 KPA >= -12.0 DegC -12 <= Temp degC <= 126		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Oil Temperature Sensor A/B Correlation	P2C21	Determines if one of the redundant oil temperature sensors is boased or stuck in range. Three independent tests can be used.1) Cold Start Test Compares EOT to ECT and IAT at powerup after a long soak (Fast and regular tests). 2) Warm Up Test Compares EOT to a target EOT after a large enough accumulated airflow has occurred. 3) Continuous Test Compares Sensor A to Sensor B.	**Fast Cold Start Test** To indicate an fast fail: Absolute value of Powerup EOT - Powerup ECT AND Absolute value of Powerup IAT - Powerup ECT To indicate a fast pass: Absolute value of Powerup EOT - Powerup ECT AND Absolute value of Powerup EOT - Powerup IAT	EOT Temp Diff > **P0196_FastFailTemp Diff** (See P0196 details on Supporting Tables Tab) AND < 16 degrees C < 16 degrees C AND < 16 degrees C	EOT Diagnostic main Status AND Engine Running Cold Start Specific EOT Test Conditions: Use Cold Start Diagnostic Engine Off Time Engine Off Timer Validity No active DTC's	Enabled = True Enabled > 540 Seconds = True Fault bundles: IgnitionOffTimer_FA IAT_SensorFA ECT_Sensor_Ckt_FA MAF_SensorFA EngOilTempSensorCircuit FA	Cold Start Fast Test - one failure out of one sample - test performed once per second	Type B, 2 Trips
			Cold Start Test Pass Condition 1: Absolute value of Powerup EOT - Powerup ECT AND Absolute value of Powerup EOT - minIAT OR Pass Condition 2: Absolute value of Powerup EOT - Powerup ECT	<= 16 Deg C <= 16 Deg C OR > 16 Deg C	All three tests (Cold/ Warm/Continuous) EOT Diagnostic main enable AND Engine Running Cold Start Specific EOT Test Conditions: Use Cold Start Diagnostic Engine Off Time Engine Off Timer Validity	Enabled = True Enabled > 540 Seconds = True	Cold Start Regular Test - one failure out of one sample - test performed once per second	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND (IAT minimum observed with Block Heater or (IAT minimum observed and Absolute value of power up IAT - min. observed IAT)) AND Absolute value of Powerup EOT - Powerup IAT AND Absolute value of Powerup EOT - minIAT <u>Fail Condition:</u> Absolute value of Powerup EOT - Powerup ECT AND (IAT minimum observed with Block Heater or (IAT minimum observed and Absolute value of power up IAT - min. observed IAT)) AND (Absolute value of Powerup EOT - Powerup IAT or Absolute value of Powerup EOT - minIAT) AND Absolute value of Powerup ECT - Powerup IAT	AND > -7 Deg C > -10 Deg C <= 5 Deg C AND <= 16 Deg C <= 16 Deg C > 16 Deg C AND > -7 Deg C > -10 Deg C <= 5 Deg C AND > 16 Deg C > 16 Deg C AND <= 16 Deg C	Time above Minimum Vehicle Speed Time less than Vehicle speed resets above timer No active DTC's	> 9 MPH for > 400 seconds < 15.0 for > 20.0 seconds Fault bundles: IgnitionOffTimer_FA IAT_SensorFA ECT_Sensor_Ckt_FA MAF_SensorFA EngOilTempSensorCircuit FA		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			AND Absolute value of Powerup ECT - minIAT	AND <= 16 Deg C				
			Warmup Test Warm Up Fail Condition: EOT Warm Up Test Pass Condition: EOT	 < 70 Deg C => 70 Deg C	EOT Diagnostic main enable Engine Running Warm Up EOT Test Specific Conditions: Use Warm Up EOT Diagnostic Power up ECT Power up ECT Total accumulated engine airflow since engine start DISABLE CONDITIONS (for all three tests)No active DTC's	Enabled = True Disabled > 200 degrees C < 200 degrees C >= **P0196_TotalAccumulatedFlow** (See P0196 details on Supporting Tables Tab) Fault bundles: IAT_SensorFA ECT_Sensor_Ckt_FA MAF_SensorFA EngOilTempSensorCircuitFA	Warm up Tests - one failure out of one sample - test performed once per second	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Continuous Test <u>Pass Condition:</u> (Measured Oil Temperature A - Measured Oil Temperature B) OR Absolute value of (Measured Oil Temperature A - Measured Oil Temperature B) <u>Fail Condition:</u> (Measured Oil Temperature A - Measured Oil Temperature B) AND Absolute value of (Measured Oil Temperature A - Measured Oil Temperature B)	>= 0 and <= 15.8 OR >= 0 and <= 15.8 > 15.8 AND > 15.8	Redundant Sensor Enable EOT Diagnostic main Enable Engine Running Continuous EOT Test Specific Conditions: Power up ECT and ECT All of three criteria above AND EOT Model Oil Temperature reach Equilibrium OR Use quick transition to equilibrium state and ECT DISABLE CONDITIONS (for all three tests)No active DTC's	Enabled Enabled = True Enabled >= -7 and <= 105 Deg C >= 45 and <= 105 Deg C >= 70 Deg C Enabled and >= ECT from 5 sec previous Fault bundles: IAT_SensorFA ECT_Sensor_Ckt_FA MAF_SensorFA EngOilTempSensorCircuitFA IAT_SensorCircuitFA EngOilModeledTempValid	Continuous Test 8 failures out of 10 samples performed once per second	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cold Start Wastegate Position Sensor A Circuit Performance	P2C9B	Detects a performance failure on the electronic wastegate acutuator system during engine cold start conditions The diagnose will fail if at least one of supervision fails. * Position deviation supervision * Actuator current supervision * Actuator Duty Cycle supervision In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	Actuator is in Normal operation Abs(Position Error) for at least	 > 20.0 % > 1.0 sec	Diagnostic enabled ***************************** Engine not in crank mode Engine is in cold stard conditions Diagnostic system not disabled Device control Component test not active	True *****************************	25 failures out of 30 samples 100ms / sample	Type A, 1 Trips
			Abs(Actuator current) for at least	> 1.0 A > 1.0 sec	Diagnostic enabled ***************************** Engine not in crank mode Engine is in cold stard conditions Diagnostic system not disabled Device control Component test not active	True *****************************	25 failures out of 30 samples 100ms / sample	
			Abs(Actuator DC) for at least	> 40.0 % DC > 1.0 sec	Diagnostic enabled ***************************** Engine not in crank mode Engine is in cold stard conditions Diagnostic system not disabled Device control Component test not active	True *****************************	25 failures out of 30 samples 100ms / sample	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 1 Low Voltage	P3051	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 1 for short to ground faults.	DC/DC Converter Actuator Voltage Raw Value 1	< 1 Volt	Diagnostic enabled Run/Crank or Accessory Battery Voltage	TRUE TRUE >= 6.60 Volts	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 2 Low Voltage	P3052	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 2 for short to ground faults.	DC/DC Converter Actuator Voltage Raw Value 2	< 1 Volt	Diagnostic enabled Run/Crank or Accessory Battery Voltage	TRUE TRUE >= 6.60 Volts	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 1 High Voltage	P3053	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 1 for short to battery faults.	DC/DC Converter Actuator Voltage Raw Value 1	> 28 Volt	Diagnostic enabled Run/Crank or Accessory Battery Voltage	TRUE TRUE >= 6.60 Volts	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage Sensor Circuit 2 High Voltage	P3054	Diagnoses the DC/DC Converter Actuator Voltage Sensor Circuit 2 for short to battery faults.	DC/DC Converter Actuator Voltage Raw Value 2	> 28 Volt	Diagnostic enabled Run/Crank or Accessory Battery Voltage	TRUE TRUE >= 6.60 Volts	640 failed samples out of 800 samples in 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage 1 Performance	P3055	Detects DC/DC Converter Actuator Voltage 1 Performance issues	Bypass Mode: Absolute value of voltage difference between DC/DC Converter Actuator Voltage Raw Value 1 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine running OR Engine stopped Battery Voltage	TRUE TRUE for > 160 loops in 6.25 ms loop for > 160 loops in 6.25 ms loop >= 6.60 Volts	640 failed samples out of 800 samples in a 6.25 ms loop	Type B, 2 Trips
			Stabilize Mode- Auto-Cranking: Absolute value of voltage difference between DC/DC Converter Actuator Voltage Raw Value 1 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking Battery Voltage	TRUE TRUE for > 0 loops in 6.25 ms loop >= 6.60 Volts	16 failed samples out of 32 samples in a 6.25 ms loop	
			Stablize Mode-Auto-Cranking Events: Number of failed auto-cranking events exceeds threshold	> 2 failed auto-cranking events	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking	TRUE TRUE has occurred	2 failed auto-crank events out of 3 consecutive auto-crank events	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Actuator Voltage 2 Performance	P3056	Detects DC/DC Converter Actuator Voltage 2 Performance issues	Bypass Mode: Absolute value of voltage difference between DC/ DC Converter Actuator Voltage Raw Value 2 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine running OR Engine stopped Battery Voltage	TRUE TRUE for > 160 loops in 6.25 ms loop for > 160 loops in 6.25 ms loop >= 6.60 Volts	640 failed samples out of 800 samples in a 6.25 ms loop	Type B, 2 Trips
			Stabilize Mode- Auto-Cranking: Absolute value of voltage difference between DC/ DC Converter Actuator Voltage Raw Value 2 and ECM Run/Crank	> 1 Volt	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking Battery Voltage	TRUE TRUE for > 0 loops in 6.25 ms loop >= 6.60 Volts	16 failed samples out of 32 samples in a 6.25 ms loop	
			Stablize Mode-Auto-Cranking Events: Number of failed auto-cranking events exceeds threshold	> 2 failed auto-cranking events	Diagnostic enabled Run/Crank or Accessory Engine auto-cranking	TRUE TRUE has occurred	2 failed auto-crank events out of 3 consecutive auto-crank events	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Ignition Switch Run/ Start Position Ciruit High Voltage	P305B	Diagnoses the DC/DC Converter Ignition Switch Run/Start Position circuit for circuit high faults	DC/DC Converter Ignition Switch Run/Start Position	<> ECM Ignition Switch Run/Start Position	Diagnostic enabled Run/Crank Accessory Battery Voltage	TRUE FALSE TRUE >= 6.60 Volts	320 failed samples out of 400 samples in a 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Ignition Switch Run/ Start Position Ciruit Low Voltage	P305C	Diagnoses the DC/DC Converter Ignition Switch Run/Start Position circuit for circuit low faults	DC/DC Converter Ignition Switch Run/Start Position	<> ECM Ignition Switch Run/Start Position	Diagnostic enabled Run/Crank Accessory Battery Voltage	TRUE TRUE TRUE >= 6.60 Volts	640 failed samples out of 800 samples in a 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Crank Control Circuit High Voltage	P305D	Diagnoses the DC/DC Converter Crank Control Circuit for circuit high faults	DC/DC Converter Crank Control	<> ECM Crank Control	Diagnostic enabled Run/Crank ECM Crank Control Battery Voltage	TRUE TRUE FALSE >= 6.60 Volts	640 failed samples out of 800 samples in a 6.25 ms loop	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
DC/DC Converter Crank Control Circuit Low Voltage	P305E	Diagnoses the DC/DC Converter Crank Control Circuit for circuit low faults	DC/DC Converter Crank Control	<> ECM Crank Control	Diagnostic enabled Run/Crank or Accessory ECM Crank Control Battery Voltage	TRUE TRUE TRUE >= 6.60 Volts	24 failed samples out of 32 samples in a 6.25 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.
Engine Coolant Pump Speed Out of Range Low	P3071	This diagnostic detects if the actual speed is out of range low. If the enable criteria are met and the actual speed 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 Speed	<= -10.00 RPM	All of the following criteria are met for 12V System Voltage PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoI	>= 1.00 s > 11.00 V (with hysteresis disable < 10.00 V) = Not Active	4 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.
Engine Coolant Pump Speed Out of Range High	P3072	This diagnostic detects if the actual speed is out of range high. If the enable criteria are met and the actual speed 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 Speed	>= 6,350.00 RPM	All of the following criteria are met for 12V System Voltage PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoI	>= 1.00 s > 11.00 V (with hysteresis disable < 10.00 V) = Not Active	4 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.
Engine Coolant Pump Current Out of Range Low	P3073	This diagnostic detects if the actual motor current is out of range low. If the enable criteria are met and the actual current 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. There are two different failure criteria depending on the pump commanded state (ON, OFF), however one time window is used to mature the diagnostic, and is not independent for each commanded state.	Pump Motor AC Current Pump Motor AC Current	< 0.00 A when Enable 1 is met <= 0.50 A when Enable 1 and Enable 2 are met	(Enable 1) 12V System Voltage PECR_MainCoolPmpMtrACC_Av PECR_MainCoolPmpMtrACC_Fol (Enable 2) All of the following criteria are met for Pump Enable Pump Speed Request PECR_EMP_SpeedUndr_FA	 > 11.00 V (with hysteresis disable < 10.00 V) = Not Active >= 2.00 s = True >= 810.00 RPM = Not Active	4 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.
Engine Coolant Pump Current Out of Range High	P3074	This diagnostic detects if the actual motor current is out of range high. If the enable criteria are met and the actual current 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 Motor AC Current	>= 80.00 A	12 System Voltage PECR_MainCoolPmpMtrACC_Av PECR_MainCoolPmpMtrACC_FoI	> 11.00 V (with hysteresis disable < 10.00 V) = Not Active	4 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.
Engine Coolant Pump Low Current Performance	P3075	The current performance diagnostic detects and reports failure of the pump or the cooling system flow. The diagnostic consists of an intrusive test performed each drive cycle if the necessary enable conditions are met and a passive test that runs continuously when the intrusive test is not executing. Only the intrusive test can report a diagnostic fail or pass result. Pump low current condition is when the actual electrical current is less than the expected electrical current for the reported pump speed. If the enable criteria are met, the intrusive test controls the pump to a calibratable speed for a calibratable time, during this time, if the actual current is less than the low current calibration failure threshold, the diagnostic reports a FAIL. If the actual current does not fall below the low current calibration failure threshold, the	Intrusive Test: Any of the following criteria is met Criteria 1: **P3075 3076 Pump** a) **Current Scaled** (A) b) EECR_EngineInlet_FA is Not Active Criteria 2: a) Pump Motor AC Current (See supporting tables for the above threshold values) The intrusive test runs at least once every drive cycle, but may be enabled again if the passive test has determined a potential failure after the intrusive diagnostic has passed.	< **P3075 Pump Low Current Performance Failure Threshold** (A) (See supporting tables for the above threshold values)	12V System Voltage PECR_MainCoolPmpMtrACC_Av PECR_MainCoolPmpMtrACC_FoI PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoFA PECR_MainCoolPmpSpdAct_FoI PECR_MainCoolPmpSpdAct_LcFA PECR_EMP_CurrOORL_FA PECR_EMP_CurrOORH_FA PECR_EMP_SpdBndl_FA PECR_EMP_CurrPerfLo_TFTKO PECR_EMP_CurrPerfHi_TFTKO VECR_BRV_Ckt_FA VECR_BRV_Performance_FA VECR_MRV_ActrFA EECR_EngineOutlet_FA Pump Enable Engine Block Valve Coolant Flow in Range Coolant Flow Restriction Factor in Range Pump Intrusive Test Timer Pump Speed Feedback in Range	>= 10.20 V = Not Active = True 20.00 to 100.00 % 0.60 to 1.00 < 15.00 s 3,800.00 RPM to 4,200.00 RPM	4 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.
		diagnostic reports a PASS.			All of the following criteria are met for a) Coolant Distribution Mode (Criteria is met when the array table for the given distribution mode is TRUE) b) Coolant System Mode (Criteria is met when the array table for the given distribution mode is TRUE) Any of the following criteria is met for Criteria 1: a) Passive Test Result b) Desired Air Per Cylinder Criteria 2: a) Passive Test Result b) Desired Air Per Cylinder Any of the following criteria is met: Criteria 1: a) PECR_EMP_CurrPerfHi_TPTKO	>= 2.00 s = **P3075 3076 Pump Current Performance Coolant Distribution Mode** (1 is TRUE) = **P3075 3076 Pump Current Performance Coolant System Mode Select** (1 is TRUE) >= 2.00 s = Fail > 100.00 mg (with hysteresis disable < 80.00 mg) = Not Fail > 100.00 mg (with hysteresis disable < 80.00 mg)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					PECR_EMP_CurrPerfLo_TPTKO b) Pump Intrusive Test Attempts Criteria 2: a) Passive Test Result b) Pump Passive Requests Any of the following criteria is met: a) Engine Outlet Coolant Temperature b) OBD Coolant Enable	= Not Active <= 3.00 Count = Fail <= 3.00 Count >= 50.00 °C = True		
			Passive Test: Pump Motor AC Current The passive test has fewer enable conditions than the intrusive, and is disabled while the intrusive test runs. The passive test monitors the reported current at any given pump speed and flow restriction. Flow restriction is calculated based on the current system valve	<= **P3075 Pump Low Current Passive Test Fail Threshold** (A) (See supporting tables for the above threshold values)	12V System Voltage PECR_MainCoolPmpMtrACC_Av PECR_MainCoolPmpMtrACC_FoI PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoFA PECR_MainCoolPmpSpdAct_FoI PECR_MainCoolPmpSpdAct_LcFA PECR_EMP_CurrOORL_FA PECR_EMP_CurrOORH_FA PECR_EMP_SpdBndl_FA PECR_EMP_CurrPerfLo_TFTKO	>= 10.20 V	0.8 seconds out of a 1 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			configuration and pump speed. If the passive test determines a potential fault, then the intrusive test is re-enabled. All of the intrusive enable conditions must still be met prior to executing the intrusive test and making a diagnostic pass/fail decision.		PECR_EMP_CurrPerfHi_TFTKO VECR_BRV_Ckt_FA VECR_BRV_Performance_FA VECR_MRV_ActrFA EECR_EngineOutlet_FA Pump Enable Pump Intrusive Test Override Difference in Pump Command Speed from previous data sample to present data sample Pump Speed Feedback in Range Any of the following criteria is met: a) Engine Outlet Coolant Temperature b) OBD Coolant Enable	= Not Active = True = Not Active < 50.00 RPM for >= 3.00 s 810.00 RPM to 6,250.00 RPM for >= 2.00 s >= 50.00 °C = True		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Coolant Pump High Current Performance	P3076	The current performance diagnostic detects and reports failure of the pump or the cooling system flow. The diagnostic consists of an intrusive test performed each drive cycle if the necessary enable conditions are met and a passive test that runs continuously when the intrusive test is not executing. Only the intrusive test can report a diagnostic fail or pass result. Pump high current condition is when the actual electrical current is greater than the expected electrical current for the reported pump speed. If the enable criteria are met, the intrusive test controls the pump to a calibratable speed for a calibratable time, during this time, if the actual current is greater than the high current calibration failure threshold, the diagnostic reports a FAIL. If the actual current does not exceed the high current calibration failure threshold, the	Intrusive Test Any of the following criteria is met Criteria 1: **P3075 3076 Pump** a) **Current Scaled** (A) b) EECR_EngineInlet_FA is Not Active Criteria 2: a) Pump Motor AC Current (See supporting tables for the above threshold values) The intrusive test runs at least once every drive cycle, but may be enabled again if the passive test has determined a potential failure after the intrusive diagnostic has passed.	> **P3076 Pump High Current Performance Failure Threshold** (A) (See supporting tables for the above threshold values)	12V System Voltage PECR_MainCoolPmpMtrACC_Av PECR_MainCoolPmpMtrACC_FoI PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoFA PECR_MainCoolPmpSpdAct_FoI PECR_MainCoolPmpSpdAct_LcFA PECR_EMP_CurrOORL_FA PECR_EMP_CurrOORH_FA PECR_EMP_SpdBndl_FA PECR_EMP_CurrPerfLo_TFTKO PECR_EMP_CurrPerfHi_TFTKO VECR_BRV_Ckt_FA VECR_BRV_Performance_FA VECR_MRV_ActrFA EECR_EngineOutlet_FA Pump Enable Engine Block Valve Coolant Flow in Range Coolant Flow Restriction Factor in Range Pump Intrusive Test Timer Pump Speed Feedback in Range	>= 10.20 V = Not Active = True 20.00 to 100.00 % 0.60 to 1.00 < 15.00 s 3,800.00 RPM to 4,200.00 RPM	4 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.
		diagnostic reports a PASS.			All of the following criteria are met for a) Coolant Distribution Mode (Criteria is met when the array table for the given distribution mode is TRUE) b) Coolant System Mode (Criteria is met when the array table for the given distribution mode is TRUE) Any of the following criteria is met for Criteria 1: a) Passive Test Result b) Desired Air Per Cylinder Criteria 2: a) Passive Test Result b) Desired Air Per Cylinder Any of the following criteria is met: Criteria 1: a)	>= 2.00 s =**P3075 3076 Pump Current Performance Coolant Distribution Mode** (1 is TRUE) =**P3075 3076 Pump Current Performance Coolant System Mode Select** (1 is TRUE) >= 2.00 s = Fail > 100.00 mg (with hysteresis disable < 80.00 mg) = Not Fail > 100.00 mg (with hysteresis disable < 80.00 mg)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					PECR_EMP_CurrPerfHi_TPTKO PECR_EMP_CurrPerfLo_TPTKO b) Pump Intrusive Test Attempts Criteria 2: a) Passive Test Result b) Pump Passive Requests Any of the following criteria is met: a) Engine Outlet Coolant Temperature b) OBD Coolant Enable	= Not Active <= 3.00 Count = Fail <= 3.00 Count >= 50.00 °C = True		
			Passive Test: Pump Motor AC Current The passive test has fewer enable conditions than the intrusive, and is disabled while the intrusive test runs. The passive test monitors the reported current at any given pump speed and flow restriction. Flow restriction is calculated	>= **P3076 Pump High Current Passive Test Fail Threshold** (A) (See supporting tables for the above threshold values)	12V System Voltage PECR_MainCoolPmpMtrACC_Av PECR_MainCoolPmpMtrACC_FoI PECR_MainCoolPmpSpdAct_Av PECR_MainCoolPmpSpdAct_FoFA PECR_MainCoolPmpSpdAct_FoI PECR_MainCoolPmpSpdAct_LcFA PECR_EMP_CurrOORL_FA PECR_EMP_CurrOORH_FA PECR_EMP_SpdBndl_FA	>= 10.20 V	0.8 seconds out of a 1 seconds window	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			based on the current system valve configuration and pump speed. If the passive test determines a potential fault, then the intrusive test is re-enabled. All of the intrusive enable conditions must still be met prior to executing the intrusive test and making a diagnostic pass/fail decision.		PECR_EMP_CurrPerfLo_TFTKO PECR_EMP_CurrPerfHi_TFTKO VECR_BRV_Ckt_FA VECR_BRV_Performance_FA VECR_MRV_ActrFA EECR_EngineOutlet_FA Pump Enable Pump Intrusive Test Override Difference in Pump Command Speed from previous data sample to present data sample Pump Speed Feedback in Range Any of the following criteria is met: a) Engine Outlet Coolant Temperature b) OBD Coolant Enable	= Not Active = True = Not Active < 50.00 RPM for >= 3.00 s 810.00 RPM to 6,250.00 RPM for >= 2.00 s >= 50.00 °C = True		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 4 Control Circuit Open	P3080	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 4 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	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips
					Ignition switch is in crank or run position			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 4 Control Circuit Low Voltage	P3081	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 4 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 4 Control Circuit High Voltage	P3082	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 4 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 4 Performance	P3083	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 4	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 4 Pin Stuck	P3084	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 4 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 5 Control Circuit Open	P3085	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 5 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 5 Control Circuit Low Voltage	P3086	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 5 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 5 Control Circuit High Voltage	P3087	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 5 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 5 Performance	P3088	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 5	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 5 Pin Stuck	P3089	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 5 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 6 Control Circuit Open	P308A	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 6 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 6 Control Circuit Low Voltage	P308B	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 6 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 6 Control Circuit High Voltage	P308C	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 6 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 6 Performance	P308D	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 6	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 6 Pin Stuck	P308E	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 6 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 7 Control Circuit Open	P308F	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 7 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 7 Control Circuit Low Voltage	P3090	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 7 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 7 Control Circuit High Voltage	P3091	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 7 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 7 Performance	P3092	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 7	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 7 Pin Stuck	P3093	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 7 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 8 Control Circuit Open	P3094	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 8 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 Ignition switch is in crank or run position	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 8 Control Circuit Low Voltage	P3095	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 8 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 8 Control Circuit High Voltage	P3096	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator 8 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 8 Performance	P3097	An Uninteded pin firing wlithout controller command. Intake Camshaft Profile Actuator 8	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intake Camshaft Profile Actuator 8 Pin Stuck	P3098	Monitors Sliding Cam Actuator Hall Sensor Feedback looking for an extended pin when it should have been returned and be reporting above the "RETRACTED" threshold. Monitors Intake Camshaft Profile Actuator 8 for a pin stuck out condition.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00) If EXTENDING and or EXTENDED have been obtained but RETRACTED is not obtained before the end of the engine cycle, Pin Stuck out is reported.	Feed back has reported below EXTENDED 55.00 and or below EXTENDED 45.00 , but has not reported above RETRACTED by the end of the engine cycle the fault is reported 68.00 ,	system voltage engine running	> 11.00 Volts = TRUE	1.00 failure report out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 4 Circuit Open	P3099	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 4 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	> 11.00 Volts	4.00 Fails out of 5.00 samples	Type A, 1 Trips
					Ignition switch is in crank or run position			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 4 Circuit Low Voltage	P309A	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 4 solenoid 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 4 Circuit High Voltage	P309B	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Actuator 4 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	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Exhaust Camshaft Profile Actuator 4 Performance	P309C	An Uninteded pin firing wlithout controller command. Exhaust Camshaft Profile Actuator 4	Detected an Uninteded pin firing wlithout controller command.	System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) If actuator below 55.00 threshold without command	system voltage engine running	> 11.00 Volts = TRUE	4.00 incorrect positions out of 5.00 cylinder event position reads	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor D Circuit Bank 1	P30B0	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor D 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor D Range/ Performance Bank 1	P30B1	Intake Hall Sensor 4 position feedback not matching expected	DTC detects shift Pin Position Hall feedback If Hall Feedback signal seen but no shift command was sent to actuator. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED(Pin returned to home position 68.00)	 Pin Hall Feedback registers below 55.00 , then below 45.00 , then above 68.00 ,	System Voltage Engine Running No Active P Codes	> 11.00 Volts = TRUE CrankSensor_FA CrankSensor_TFTKO CamLctnIntFA CamSnsrIntTFTKO CamLctnExhFA CamSnsrExhTFTKO	4.00 samples out of 5.00 reading	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor D Circuit Low Bank 1	P30B2	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor D solenoid 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	4.00 failures out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Actuator Position Sensor D Circuit High Bank 1	P30B3	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Actuator Position Sensor D 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 off Ignition switch is in crank or run position	> 11.00 Volts	4.00 fail reports out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Control Sleeve Position Sensor A Circuit Bank 1	P30BE	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Position Sensor A 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 No P Codes active	> 11.00 Volts CamSensorAnyLctnTFTKO CrankSensor_TFTKO	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Control Sleeve Position Sensor A Range/ Performance Bank 1	P30BF	Monitors the output of the Sliding Cam Position Sensor for expected and in range signals. Intake sensor 1	First section of Diagnostic is the same as our CAM Sensor Performance Diagnostic Logic, it is using the same Sensors for Camshaft Profile Control Sleeve Position detection diagnostics. Hence they are diagnosed using the same methods. The diagnostic looks at the number of rising and falling edges seen in an engine cycle. 2 edges per engine cycle = PASS 0 edges per engine cycle with signal low = Short to Ground or Open OR 0 edges per engine cycle with signal High = Short to Power OR (2nd SECTION) Failed lift state change attempt signal sequence. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position	number of edges read this engine cycle <> 2.00 Buffer reading low signals Buffer reading High signals System feed back has reported less than all of the following: EXTENDING (below 55.00), EXTENDED (below 45.00) RETRACTED (above 68.00), and the barrel	system voltage engine running No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	16.00 fails out of 20.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			68.00) We expect to see all 3 steps in sequence followed by the Position Sensor indicating a new lift state. Failure to receive any of the above indicate a failure.	position sensor identifying that the lift state has changed. Observation window. Not missing EXTENDED reading: 30.00 events Missing the EXTENDED reading: 20.00 events				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Control Sleeve Position Sensor B Circuit Bank 1	P30C2	Controller specific output driver circuit diagnoses the Intake Camshaft Profile Position Sensor B 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 No P Codes active	> 11.00 Volts CamSensorAnyLctnTFTKO CrankSensor_TFTKO	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Control Sleeve Position Sensor B Range/ Performance Bank 1	P30C3	Monitors the output of the Sliding Cam Position Sensor for expected and in range signals Intake 2	First section of Diagnostic is the same as our CAM Sensor Performance Diagnostic Logic, it is using the same Sensors for Camshaft Profile Control Sleeve Position detection diagnostics. Hence they are diagnosed using the same methods. The diagnostic looks at the number of rising and falling edges seen in an engine cycle. 2 edges per engine cycle = PASS 0 edges per engine cycle with signal low = Short to Ground or Open OR 0 edges per engine cycle with signal High = Short to Power OR (2nd SECTION) Failed lift state change attempt signal sequence. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00)	number of edges read this engine cycle <> 2.00 Buffer reading low signals Buffer reading High signals System feed back has reported less than all of the following: EXTENDING (below 55.00), EXTENDED (below 45.00) RETRACTED (above 68.00), and the barrel position sensor identifying that the lift state has changed.	system voltage engine running No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	16.00 fails out of 20.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			We expect to see all 3 steps in sequence followed by the Position Sensor indicating a new lift state. Failure to receive any of the above indicate a failure.	Observation window. Not missing EXTENDED reading: 30.00 events Missing the EXTENDED reading: 20.00 events				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Control Sleeve Position Sensor A Circuit Bank 1	P30C6	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Position Sensor A 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 No P Codes active	> 11.00 Volts CamSensorAnyLctnTFTKO CrankSensor_TFTKO	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Control Sleeve Position Sensor A Range/ Performance Bank 1	P30C7	Monitors the output of the Sliding Cam Position Sensor for expected and in range signals Exhaust 1	First section of Diagnostic is the same as our CAM Sensor Performance Diagnostic Logic, it is using the same Sensors for Camshaft Profile Control Sleeve Position detection diagnostics. Hence they are diagnosed using the same methods. The diagnostic looks at the number of rising and falling edges seen in an engine cycle. 2 edges per engine cycle = PASS 0 edges per engine cycle with signal low = Short to Ground or Open OR 0 edges per engine cycle with signal High = Short to Power OR (2nd SECTION) Failed lift state change attempt signal sequence. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00)	number of edges read this engine cycle <> 2.00 Buffer reading low signals Buffer reading High signals System feed back has reported less than all of the following: EXTENDING (below 55.00), EXTENDED (below 45.00) RETRACTED (above 68.00), and the barrel position sensor identifying that the lift state has changed.	system voltage engine running No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	16.00 fails out of 20.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			We expect to see all 3 steps in sequence followed by the Position Sensor indicating a new lift state. Failure to receive any of the above indicate a failure.	Observation window. Not missing EXTENDED reading: 30.00 events Missing the EXTENDED reading: 20.00 events				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
“B" Camshaft Profile Control Sleeve Position Sensor B Circuit Bank 1	P30CA	Controller specific output driver circuit diagnoses the Exhaust Camshaft Profile Position Sensor B 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 positionsystem voltage No P Codes active	> 11.00 Volts CamSensorAnyLctnTFTKO CrankSensor_TFTKO	4.00 fails out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Control Sleeve Position Sensor B Range/ Performance Bank 1	P30CB	Monitors the output of the Sliding Cam Position Sensor for expected and in range signals Exhaust 2	First section of Diagnostic is the same as our CAM Sensor Performance Diagnostic Logic, it is using the same Sensors for Camshaft Profile Control Sleeve Position detection diagnostics. Hence they are diagnosed using the same methods. The diagnostic looks at the number of rising and falling edges seen in an engine cycle. 2 edges per engine cycle = PASS 0 edges per engine cycle with signal low = Short to Ground or Open OR 0 edges per engine cycle with signal High = Short to Power OR (2nd SECTION) Failed lift state change attempt signal sequence. System measures 3 states for each shift, EXTENDING (Pin started firing 55.00), EXTENDED (Pin completely fired 45.00), RETRACTED (Pin returned to home position 68.00) We expect to see all 3	number of edges read this engine cycle <> 2.00 Buffer reading low signals Buffer reading High signals System feed back has reported less than all of the following: EXTENDING (below 55.00), EXTENDED (below 45.00) RETRACTED (above 68.00), and the barrel position sensor identifying that the lift state has changed. Observation window.	system voltage engine running No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	16.00 fails out of 20.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			steps in sequence followed by the Position Sensor indicating a new lift state. Failure to receive any of the above indicate a failure.	Not missing EXTENDED reading: 30.00 events Missing the EXTENDED reading: 20.00 events				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Control Sleeve "A" Alignment	P30CE	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change.	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change. Sleve Position Sensors identify a shift from High Lift, Low Lift or AFM to one of the other states with out the control system commanding the shift.	If current Barrel state (High Lift, Low Lift, AFM) is not equal to previous Barrel state (High Lift, Low Lift, AFM) and a state change was not commanded a failure is registered.	system voltage engine run state No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	1.00 reading out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"A" Camshaft Profile Control Sleeve "B" Alignment	P30CF	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change.	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change. Sleve Position Sensors identify a shift from High Lift, Low Lift or AFM to one of the other states with out the control system commanding the shift.	If current Barrel state (High Lift, Low Lift, AFM) is not equal to previous Barrel state (High Lift, Low Lift, AFM) and a state change was not commanded a failure is registered	system voltage engine run state No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	1.00 reading out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Control Sleeve "A" Alignment	P30D0	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change.	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change. Sleve Position Sensors identify a shift from High Lift, Low Lift or AFM to one of the other states with out the control system commanding the shift.	If current Barrel state (High Lift, Low Lift, AFM) is not equal to previous Barrel state (High Lift, Low Lift, AFM) and a state change was not commanded a failure is registered	system voltage engine run state No active Pcodes	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	1.00 reading out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
"B" Camshaft Profile Control Sleeve "B" Alignment	P30D1	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change.	The system monitors the Sliding Cam Control Sleve Position Sensors looking for an unintended shift. A recorded change in lift state without a control system command for a state change. Sleve Position Sensors identify a shift from High Lift, Low Lift or AFM to one of the other states with out the control system commanding the shift.	If current Barrel state (High Lift, Low Lift, AFM) is not equal to previous Barrel state (High Lift, Low Lift, AFM) and a state change was not commanded a failure is registered	system voltage engine run state No P codes active	> 11.00 Volts = TRUE CamSensorAnyLctnTFTKO CrankSensor_TFTKO	1.00 reading out of 5.00 samples	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Injector Circuit Range/ Performance	P30D4	Diagnostic to determine if any of the voltage feedback measured from the analog to digital converter on any cylinder is rational (total engine based). The measured voltage is checked when the injection pulse width is large enough ensuring the injector pintle has achieved max travel and the injector voltage flux through the coil has reach the max stabilization limit.	Injector voltage feedback is not able to detect an opening magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Measured Voltage feedback converted to Injector Opening Magnitude OR Injector voltage feedback is not able to detect a closing time OR Measured Voltage feedback converted to Injector closing time OR Measured Voltage	=< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Opening Magnitude** (See supporting table) >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Opening Magnitude** (See supporting table) =< **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Closing Time** (See supporting table) >=	Small Pulse General Diagnostic Enable (See Definition in Supporting Material below) Fuel Pulse Voltage Feedback Data Valid (See Definition in Supporting Material below) Injection Pulse Width	= True >= **P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Voltage Feedback Rationalities Minimum Pulse Width**	2.50 Second Fail count out of 10.00 seconds Samples Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			feedback converted to Injector closing time	**P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Closing Time** (See supporting table)				

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	P30D6	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 2	P30D7	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 3	P30D8	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 4	P30D9	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 5	P30DA	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 6	P30DB	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 7	P30DC	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Control Module Serial Peripheral Interface Bus 8	P30DD	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.		Run/Crank voltage	>= 6.41 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent 12.5 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.
Brake System Vehicle Speed Limit Request Signal Message Counter Incorrect	P314F	This DTC monitors for an error in communication with the Brake System Vehicle Speed Limit Request Signal	Communication of the Alive Rolling Count or Protection Value of the Brake System Vehicle Speed Limit Request Signal over CAN bus is incorrect for out of total samples	 >= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is avaialble >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 250ms 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 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) 0.81 seconds	General Enable Criteria: U0073 Normal CAN transmission on Bus A CAN hardware is bus OFF for The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown impending Power Mode	 Not Active on Current Key Cycle Enabled > 162.5000 seconds >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False = Not Run/Crank	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	5 counts (equivalent to 0.06 seconds)	General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
			before the sample time of is reached	0.81 seconds				
					Normal CAN transmission on Bus B	Enabled		
					CAN hardware is bus OFF for	> 162.5000 seconds		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication Powertrain Sensor CAN Bus Off	U0076	This DTC monitors for a Powertrain Sensor Bus S off condition	Bus off failures exceeds	5 counts (equivalent to 0.06 seconds)	General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0076	Not Active on Current Key Cycle		
			before the sample time of is reached	0.81 seconds				
					Normal CAN transmission on Bus S	Enabled		
					CAN hardware is bus OFF for	> 162.5000 seconds		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With TCM	U0101	This DTC monitors for a loss of communication with the transmission control module	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			Message $0BD	≥ 10,000.00 milliseconds				
					Normal CAN transmission on Bus A	Enabled		
			Message $0C7	≥ 500.00 milliseconds				
			Message $0F9	≥ 500.00 milliseconds	The following criteria have been enabled for	>= 3,000.00 milliseconds		
			Message $189	≥500.00 milliseconds				
					Transition from accessory mode to off is pending	= False		
			Message $199	≥ 500.00 milliseconds				
			Message $19D	≥500.00 milliseconds	Battery Voltage	> 11.00 Volts		
			Message $1AF	≥ 500.00 milliseconds	Ignition Voltage Criteria:			
			Message $1F5	≥ 500.00 milliseconds	Power Mode	= Run		
			Message $4C9	≥ 10,000.00 milliseconds	Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U0101	Not Active on Current Key Cycle		
					TCM	is present on the bus		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Transfer Case Control Module	U0102	This DTC monitors for a loss of communication with the Transfer Case Control Module. Emission neutral default state is 100% of the torque is split to the primary/rear axle and 0% to the secondary axle and the transfer case defaults to the "high" value once the vehicle is at a low speed and with low throttle input. The transfer case range continues to output the calculated range based on transfer case input and output speeds – these input/output speeds are OBD compliant.	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type C, No SVS "Emissions Neutral Diagnostics – Type C"
					U0073	Not Active on Current Key Cycle		
			Message $1CB	≥ 10,000.00 milliseconds				
					Normal CAN transmission on Bus A	Enabled		
			Message $1CC	≥ 500.00 milliseconds				
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U0102	Not Active on Current Key Cycle		
					TCCM	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With 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 A, 1 Trips
					U0073	Not Active on Current Key Cycle		
			Message $0C1	≥ 500.00 milliseconds				
					Normal CAN transmission on Bus A	Enabled		
			Message $0C5	≥500.00 milliseconds				
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
			Message $0D1	≥ 500.00 milliseconds				
					Transition from accessory mode to off is pending	= False		
			Message $1C6	≥ 500.00 milliseconds				
					Battery Voltage	> 11.00 Volts		
			Message $1C7	≥ 500.00 milliseconds				
					Ignition Voltage Criteria:			
			Message $1E9	≥ 500.00 milliseconds	Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
			Message $2F1	≥ 10,000.00 milliseconds				
					Off Cycle Enable Criteria:			
			Message $2F9	≥ 500.00 milliseconds	KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					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 Power Steering Control Module	U0131	This DTC monitors for a loss of communication with the Power Steering Control Module. Emission neutral default state is disable steering angle based auto-stop inhibit and perform auto-stops.	Message is not received from controller for Message $1E5	≥ 10,000.00 milliseconds	General Enable Criteria: U0073 Normal CAN transmission on Bus A The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown impending Power Mode U0131 Power Steering Control Module	 Not Active on Current Key Cycle Enabled >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False = Not Run/Crank Not Active on Current Key Cycle is present on the bus	Diagnostic runs in 12.5 ms loop	Type C, No SVS "Safety Emissions Neutral Diagnostic"

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. Emission neutral default state is the calculated air conditioning compressor normalized load is set to 0.	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	 ≥ 500.00 milliseconds ≥ 10,000.00 milliseconds ≥ 500.00 milliseconds ≥ 500.00 milliseconds ≥ 10,000.00 milliseconds ≥10,000.00 milliseconds ≥ 10,000.00 milliseconds ≥ 10,000.00 milliseconds ≥ 500.00 milliseconds ≥ 10,000.00 milliseconds ≥10,000.00 milliseconds ≥ 10,000.00 milliseconds	General Enable Criteria: U0073 Normal CAN transmission on Bus A The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown impending Power Mode U0140 Body Control Module	 Not Active on Current Key Cycle Enabled >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False = Not Run/Crank Not Active on Current Key Cycle is present on the bus	Diagnostic runs in 12.5 ms loop	Type C, No SVS "Emissions Neutral Diagnostics – Type C"

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Gateway A	U0146	This DTC monitors for a loss of communication with Gateway A	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0073	Not Active on Current Key Cycle		
			Message $3CF	≥ 10,000.00 milliseconds				
					Normal CAN transmission on Bus A	Enabled		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U0146	Not Active on Current Key Cycle		
					Gateway 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 Battery Monitor Module	U01B0	This DTC monitors for a loss of communication with the Battery Monitor Module on LIN bus	Message is not received from controller for		Normal transmission on LIN Bus	Enabled	Between 100ms and 175ms due to rate of LIN communication to Battery Monitor Module.	Type B, 2 Trips
			IBSAmpHourChg_18_C02	>= 0.00 milliseconds	IBS is active	> 3.00 seconds		
					LIN channel is enabled	1.00 (1 indicates enabled)		
			IBSAmpHourDisChrg_19_C02	>= 0.00 milliseconds	Diagnostic is enabled	1.00 (1 indicates enabled)		
			IBSCalcData_16_C02	>= 0.00 milliseconds	One of the following Battery Saver Mode Diagnostics is Enabled:			
			IBSCfgDataRtn_1E_C02	>= 0.00 milliseconds				
			IBSCurrentFOMData_1A_C02	>= 0.00 milliseconds	Battery Saver Mode Level 4 Diagnosis	1.00 (1 indicates enabled)		
			IBSFOMData_1C_C02	>= 0.00 milliseconds	Battery Saver Mode Level 5 Diagnosis	1.00 (1 indicates enabled)		
			IBSMeasuredTemp_17_C02	>= 0.00 milliseconds				
					Battery Saver Mode Level 6 Diagnosis	1.00 (1 indicates enabled)		
			IBSMVIData_15_C02	>= 0.00 milliseconds				
			IBSVehStartData_1D_C02	>= 0.00 milliseconds	Battery Saver Mode Level 7 Diagnosis	1.00 (1 indicates enabled)		
			IBSVoltageFOMData_1B_C02	>= 0.00 milliseconds	The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					Battery Monitor Module	is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Active Grill Air Shutter Module A	U0284	This DTC monitors for a loss of communication on the LIN bus with Shutter Module A	Message is not received from controller for		Normal transmission on LIN Bus	Enabled	LIN bus communication executes in 500ms loop	Type B, 2 Trips
			ACM1Rsp_31_C02	>= 0.00 milliseconds	Actuator relay	is powered		
			ACM1Rsp_31_C01	>= 0.00 milliseconds	Or			
					Powertrain Relay	is on		
					and			
					Powertrain Relay state feedback is enabled	1.00 (1 indicates enabled)		
					LIN channel is enabled	1.00 (1 indicates enabled)		
					Diagnostic is enabled	1.00 (1 indicates enabled)		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					Power Mode ACM1	= Not Run/Crank is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Active Grill Air Shutter Module B	U0285	This DTC monitors for a loss of communication on the LIN bus with Shutter Module B	Message is not received from controller for		Normal transmission on LIN Bus	Enabled	LIN bus communication executes in 500ms loop	Type B, 2 Trips
			ACM2Rsp_31_C02	>= 0.00 milliseconds	Actuator relay	is powered		
			ACM2Rsp_31_C01	>= 0.00 milliseconds	Or			
					Powertrain Relay and	is on		
					Powertrain Relay state feedback is enabled	1.00 (1 indicates enabled)		
					LIN channel is enabled	1.00 (1 indicates enabled)		
					Diagnostic is enabled	1.00 (1 indicates enabled)		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown	= False		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					impending			
					Power Mode	= Not Run/Crank		
					ACM2	is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Mass or Volume Air Flow Sensor A	U060F	This DTC monitors for a loss of communication on the LIN bus with Mass or Volume Air Flow Sensor A	Message is not received from MAF for MAF_Rsp_Press_2B_C03 MAF_Rsp_TmpHum_2A_C03	 >= 0.00 milliseconds >= 0.00 milliseconds	Normal transmission on LIN Bus Actuator relay Or Powertrain Relay and Powertrain Relay state feedback is enabled LIN channel is enabled Diagnostic is enabled The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown impending	Enabled is powered is on 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False	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.
					Power Mode MAF	= Not Run/Crank is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Engine Coolant Bypass Valve C	U0617	Communication Check This DTC will detect if SENT communication was lost for the Engine Coolant Bypass Valve C Sensor	If any of the following conditions are met a failure count will be recorded: **Condition 1:** HWIO message faults **Condition 2:** Pulse count delta AND Message age **Condition 3:** Voltage on SENT pin is greater than a controller specific threshold AND Message age **Condition 4:** Voltage on SENT pin is less than a controller specific threshold AND Message age	= No Fault >0 > 6.25 ms > 6.25 ms > 6.25 ms	Run Crank Ignition in Range Engine not cranking Engine Diag System	= True = True = Enabled	4 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.
Loss of communication with wastegate position sensor “A”	U0644	Detects a continuous communication fault on the eWG "A" SENT interface. The diagnostic monitors the SENT message in respect to message pulses and timing validity. In series applications, turbocharger 'A' is the first turbocharger in the direction of exhaust flow. In parallel applications, turbocharger 'A' is associated with engine bank 1.	SENT Mesage Faults SENT Mesage age	> 0 cnt > 6.25 ms	Diagnostic enabled and Sent Interface used **************************** Powertrain relay voltage **************************** Engine does not crank Diagnostic system not disabled	True True **************************** >= 11.0 Volts ****************************	10 failures out of 12 samples 100ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Engine Coolant Pump	U0672	This DTC monitors for a loss of communication on the LIN bus with the Engine Coolant Pump	Message is not received from controller for MWP_Rsp_0F_C05	 >= 0.00 milliseconds	Normal transmission on LIN Bus Actuator relay Or Powertrain Relay and Powertrain Relay state feedback is enabled LIN channel is enabled Diagnostic is enabled The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown	Enabled is powered is on 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False	LIN bus communication executes in 500ms loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					impending Power Mode Engine Coolant Pump	 = Not Run/Crank is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Engine Coolant Bypass Valve D	U111A	This DTC monitors for a loss of communication on the LIN bus with Engine Coolant Bypass Valve D	Message is not received from controller for BRV_Rsp_29_C05	 >= 0.00 milliseconds	Normal transmission on LIN Bus Actuator relay Or Powertrain Relay and Powertrain Relay state feedback is enabled LIN channel is enabled Diagnostic is enabled The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown	Enabled is powered is on 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False	LIN bus communication executes in 500ms loop	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					impending Power Mode Engine Coolant Bypass Valve D	 = Not Run/Crank is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with EVAP Purge Pump	U111E	This DTC monitors for a loss of communication on the LIN bus with the EVAP Purge Pump	Message is not received from controller for EVAPP_Rsp_01_C05	>= 0.00 milliseconds	Normal transmission on LIN Bus Actuator relay Or Powertrain Relay and Powertrain Relay state feedback is enabled LIN channel is enabled Diagnostic is enabled The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown	Enabled is powered is on 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) 1.00 (1 indicates enabled) >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False	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.
					impending			
					Power Mode	= Not Run/Crank		
					EVAP Purge Pump	is present on the bus and initialized		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Control Module LIN Bus 1	U1345	This DTC monitors for a LIN bus off condition on LIN Bus 1	The total number of diagnostic enabled slave nodes on LIN Bus 1	= Total number of slave nodes on LIN Bus 1 that have reported "loss commn with device"	LIN channel is enabled	1.00 (1 indicates enabled)	Dependent on bus loading.	Type B, 2 Trips
					Diagnostic is enabled	1.00 (1 indicates enabled)		
			Or					
			LIN channel wakeup repetition counter	>= 10.00 counts	The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Control Module LIN Bus 2	U1346	This DTC monitors for a LIN bus off condition on LIN Bus 2	The total number of diagnostic enabled slave nodes on LIN Bus 2 Or LIN channel wakeup repetition counter	= Total number of slave nodes on LIN Bus 2 that have reported "loss commn with device" >= 10.00 counts	LIN channel is enabled Diagnostic is enabled The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown impending Power Mode	1.00 (1 indicates enabled) 1.00 (1 indicates enabled) >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False = Not Run/Crank	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.
Engine Control Module LIN Bus 4	U1348	This DTC monitors for a LIN bus 4 off condition	The total number of diagnostic enabled slave nodes on LIN Bus 4 Or LIN channel wakeup repetition counter	= Total number of slave nodes on LIN Bus 4 that have reported "loss commn with device" >= 10.00 counts	LIN channel is enabled Diagnostic is enabled The following criteria have been enabled for Transition from accessory mode to off is pending Battery Voltage Ignition Voltage Criteria: Power Mode Run/Crank Voltage Off Cycle Enable Criteria: KeCMGD_b_OffKeyCycleDiagEnbl KeDFIR_e_OBD_ControllerType is an OBD Controller Controller shutdown impending Power Mode	1.00 (1 indicates enabled) 1.00 (1 indicates enabled) >= 3,000.00 milliseconds = False > 11.00 Volts = Run >= 11.00 Volts 0.00 (1 indicates enabled) OBD Controller = False = Not Run/Crank	Dependent on bus loading.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Fuel Pump Driver Control Module on Bus S	U18A2	This DTC monitors for a loss of communication with the Fuel Pump Driver Control Module on Bus S	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
			Message $0D5	≥ 10,000.00 milliseconds				
					Normal CAN transmission on Bus B	Enabled		
			Message $0D7	≥ 10,000.00 milliseconds				
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U18A2	Not Active on Current Key Cycle		
					Fuel Pump Driver Control	is present on the bus		

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With DC/ DC Converter Control Module on Bus B	U18A7	This DTC monitors for a loss of communication with the DC/DC Converter Control Module on Bus B	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
					U0074	Not Active on Current Key Cycle		
			Message $0A0	≥ 10,000.00 milliseconds				
					Normal CAN transmission on Bus B	Enabled		
			Message $1D2	≥ 10,000.00 milliseconds				
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U18A7	Not Active on Current Key Cycle		
					DC/DC Converter Control Module	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
CGM Lost Communication with ECM	U18D5	This DTC monitors for a CGM Lost Communication with ECM error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Lost Communication with ECM DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module ECM	 is being received is present on the bus is present on the bus	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.
CGM Lost Communication with TCM	U18D7	This DTC monitors for a CGM Lost Communication with TCM error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Lost Communication with TCM DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module TCM	 is being received is present on the bus is present on the bus	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.
CGM Lost Communication with BSCM1	U18DC	This DTC monitors for a CGM Lost Communication with BSCM1 error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the CGM Lost Communication with BSCM1 DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module BSCM1	 is being received is present on the bus is present on the bus	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.
Central Gateway Module High Speed CAN Bus Off	U2413	This DTC monitors for a Central Gateway Module High Speed CAN Bus Off error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the Central Gateway Module High Speed CAN Bus Off DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
Central Gateway Module High Speed Extension CAN Bus Off	U2414	This DTC monitors for a Central Gateway Module High Speed Extension CAN Bus Off error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the Central Gateway Module High Speed Extension CAN Bus Off DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
Central Gateway Module Chassis Expansion CAN Bus Off	U2415	This DTC monitors for a Central Gateway Module Chassis Expansion CAN Bus Off error as determined by the CGM	The CGM Diagnostic Status Message signal in GMLAN frame $3CF indicates that the Central Gateway Module Chassis Expansion CAN Bus Off DTC has set in the CGM.		General Enable Criteria: Message $3CF Central Gateway Module	 is being received is present on the bus	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.
Door Open Switch Signal - Door Ajar Switch Signal Not Plausible	B2A00	Compares the Door Ajar and Door Open Switch for mismatch	Door Open Switch AND Door Ajar switch	=OPEN = CLOSED	Ignition Not Fault Active	= Run/Crank OR = Accessory U0422	240 failure out of 240 samples 12.5 ms loop	Emissions-neutral default action Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankcase Ventilation System Disconnected	P04DB	The Crankcase Ventilation System Disconnected Diagnostic monitors the performance of the Positive Crankcase Ventilation (PCV) System. After the enable conditions are met, this monitor will will evaluate the signal of the Crankcase Ventilation Pressure sensor. This sensor is mounted in the PCV hose between the crankcase and the engine induction system. During normal operation, the sensor will see a pressure drop that varies in conjunction with the engine air flow. Additionally, the sensor will see pressure pulses as the cylinders go up and down in the crankcase. This monitor evaluates both the signal offset based on the pressure drop, and the signal noise based on the pressure pulses. The product of the	ScaledSignal * ScaledNoise Where ScaledSignal = Where ScaledNoise = The Crankcase Ventilation Pressure Sensor is sampled every 3.125 msec to calculate ScaledSignal and ScaledNoise. ScaledSignal and ScaledNoise values are accumulated over a period of 0.5 Seconds.	< 0.63 kPa * kPa Average Crankcase Ventilation Pressure Signal value calculated over the sample period and normalized as a function of engine air flow based on table **P04DB: Crankcase Pressure Signal Normalization for Air Flow** Average Crankcase Ventilation Pressure Signal delta calculated over the sample period and normalized as a function of engine speed based on table **P04DB: Crankcase Pressure Noise Normalization for Engine Speed**	Outside Air Temperature Engine Coolant Temperature Barometric Pressure Stability conditions: Engine Air Flow Engine Air Flow Engine Vacuum Engine Vacuum Maximum Engine Air Flow - Minimum Engine Air Flow over the sample period Time that stability conditions must be met prior to sampling data Stability conditions must continue to be met as the data sample is collected over a period DTCs Active: DTCs Pending:	>= -9.0 Degrees C >= 65.0 Degrees C >= 70.0 kPa >= 56.0 Grams/Second <= 100.0 Grams/Second >= -100.0 kPa <= -50.0 kPa <= 20.0 Grams/Second = 0.5 Seconds = 0.5 Seconds MAF_SensorFA MAP_SensorFA OAT_PtEstFiltFA AmbPresDfltdStatus ECT_Sensor_FA PCV_Sensor_FA PCV_Sensor_Circuit_FA	The DTC will fail immediately if the malfunction criteria are met	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		signal offset and signal noise is compared to a calibration threshold during certain engine operating conditions. If this product is above a failure threshold, the system is operating as expected, and the monitor passes. If the product is below the failure threshold, the system is disconnected, and the monitor fails.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankcase Ventilation Hose Connection Sensor Circuit Low	P04E2	Detects a continuous open or short to ground in the Crankcase Ventilation Pressure signal circuit by monitoring the Crankcase Ventilation Pressure sensor output voltage and failing the diagnostic when the Crankcase Ventilation Pressure voltage is too low. The Crankcase Ventilation Pressure sensor is a pressure transducer which outputs a voltage proportional to the gauge pressure between the crankcase ventilation hose and the atmosphere.	Crankcase Ventilation Pressure Voltage	<= 4.3 % of 5 Volt Range (This is equal to -5.71 kPa)	None		1,280 failures out of 1,600 samples 1 sample every 3.125 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankcase Ventilation Hose Connection Sensor Circuit High	P04E3	Detects a continuous short to power in the Crankcase Ventilation Pressure signal circuit by monitoring the Crankcase Ventilation Pressure sensor output voltage and failing the diagnostic when the Crankcase Ventilation Pressure voltage is too high. The Crankcase Ventilation Pressure sensor is a pressure transducer which outputs a voltage proportional to the gauge pressure between the crankcase ventilation hose and the atmosphere.	Crankcase Ventilation Pressure Voltage	>= 95.5 % of 5 Volt Range (This is equal to 5.69 kPa)	None		1,280 failures out of 1,600 samples 1 sample every 3.125 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Crankcase Ventilation Hose Connection Sensor Range/ Performance	P04FB	Detects a performance failure in the Crankcase Ventilation Pressure sensor, such as when the sensor value is stuck in range. If the engine has been off for a sufficient amount of time, the pressure in the crankcase ventilation system will equalize to atmospheric pressure. The Crankcase Ventilation Pressure sensor value is checked to see if it is within the normal expected range around the expected value of 0 kPa. If it is not, the Crankcase Ventilation Pressure performance diagnostic will fail. The Crankcase Ventilation Pressure sensor is a pressure transducer which outputs a voltage proportional to the gauge pressure between the crankcase ventilation hose and the atmosphere.	Crankcase Ventilation Pressure OR Crankcase Ventilation Pressure	>= 0.63 kPa <= -0.63 kPa	Engine is not rotating Time since engine has stopped rotating Engine Coolant Temperature DTCs Active:	 >= 10.0 seconds >= 70.0 deg C PCV_Sensor_Circuit_FA ECT_Sensor_FA EngineModeNotRunTimer Error	128 failures out of 160 samples 1 sample every 3.125 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 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 > 6.00 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 > 6.00 deg AND < 26.00 deg < 3.00 deg for (**P0011_P05CC_StablePositionTimeIc1**) seconds P0010 P2088 P2089	65 failures out of 75 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.
Unable to Engage Neutral	P073D	Detects the inability to achieve or remain in Neutral.	Actual Arbitrated Transmission Range	≠Neutral	Actual Transmission Range Commanded Transmission Range AND CodeClearFunction AND ManufacturingModeActive AND: External: Run/Crank OR Accessory/Wakeup Internal: From the time when RunCrankActive until ActualRange AND Accessory/Wakeup	= Good value = Neutral =False =False =True = True =True =Park =False	10,000.00 msec from Park 10,000.00 msec from Reverse 10,000.00 msec from Drive	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Unable to Engage Reverse	P073E	Detects the failure to achieve the expected command to Reverse range.	Actual Arbitrated Transmission Range	≠Reverse	Actual Transmission Range Commanded Transmission Range AND CodeClearFunction AND ManufacturingModeActive AND: External: Run/Crank OR Accessory/Wakeup Internal: From the time when RunCrankActive until ActualRange AND Accessory/Wakeup	= Good value = Reverse =False =False =True =True =True =Park =False	10,000.00 msec from Park 3,600,000.00 msec from Neutral* 3,600,000.00 msec from Drive* *Internal does not diagnose from N&D	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Sensor/ Switch A Circuit Low	P07B3	The Park Button Circuit Diagnostic detects a reading LowCorrelation diagnosic compares the two switches behind the Park pushbutton	Park Position Measured Voltage	< Low 446 counts 446 counts = 43.6% of 5 Volts 1023 counts = 5 Volts			16 Failures out of 20 Samples (SIB is 5 msec loop)	DTC Type B, two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Sensor/ Switch A Circuit High	P07B4	The Park Button Circuit Diagnostic detects a reading High	Park Position Measured Voltage	> High 853 counts 853 counts = 83.3% of 5 Volts. 1023 Counts = 5 V			16 Failures out of 20 Samples (SIB is 5 msec loop)	Type B, two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Sensor/ Switch A Circuit Performance	P07B5	The Park Button Circuit Diagnostic detects a reading that is outside of the PRESSED and RELEASED zones.	Park Position Measured Voltage	(544<X<753 counts) 53.2% < X < 73.7% of 5 Volts. 1023 Counts = 5 V	DTC not set	P07B3 OR P07B4	100 Failures out of 120 Samples =500 msec (SIB is 5 msec loop)	Type B, two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Sensor/ Switch B Circuit Low	P07B9	The Park Button Circuit Diagnostic detects a reading Low	Park Position Measured Voltage	< Low 446 counts 446 counts = 43.6% of 5 Volts. 1023 Counts = 5 V	Diagnostic Enable Calibration	=TRUE	16 Failures out of 20 Samples (SIB is 5 msec loop)	Type B, two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Sensor/ Switch B Circuit High	P07BA	The Park Button Circuit Diagnostic detects a reading High	Park Position Measured Voltage	> High 853 counts 853 counts = 83.3% of 5 Volts. 1023 Counts = 5 V	Diagnostic Enable Calibration	=TRUE	16 Failures out of 20 Samples (SIB is 5 msec loop)	Type B, two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Sensor/ Switch B Circuit Performance	P07BB	The Park Button Circuit Diagnostic detects a reading that is outside of the PRESSED and RELEASED zones.	Park Position Measured Voltage	(544<X<753 counts) 53.2% < X < 73.7% of 5 Volts. 1023 Counts = 5 V	Diagnostic Enable Calibration DTC not set	=TRUE P07BA or P07B9	100 Failures out of 120 Samples =500 msec (SIB is 5 msec loop)	Type B two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Switch A/B Correlation	P07BE	Correlation diagnosic compares the two switches behind the Park pushbutton	Compares Park Switch A and Park Switch B "PRESSED" and "RELEASED" states. Park 1 and Park 2 are both valid states (RELEASED or PRESSED), but disagree.	One Switch Stuck On: Valid, but not equal continuously	Not Fault Active ECM is: Diagnostic System Disabling Variable = Park Comparison Diagnostics Enabling Calibration = Park Correlation Diagnostics Enabling Calibration = Vehicle Speed is low enough to honor Park request. Vehilce speed:	P07B3, P07B4, P07B5, P07B9, P07BA, P07BB awake =FALSE = TRUE = TRUE <= Calibrated limit. The calibration name for the vehicle speed for checking for the Park button correlation diagnostics DTC: 10.50 and 10.00 (Hysteresis)	One Switch Stuck On: 2,400.00 failures out of 3,000.00 samples at 12.5 ms rate	DTC Type B, two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Unable to Engage Park	P07E4	Detects the inability to achieve or remain in Park.	Actual Arbitrated Transmission Range	≠Park	Actual Transmission Range Commanded Transmission Range AND CodeClearFunction AND ManufacturingModeActive AND: External: Run/Crank OR Accessory/Wakeup Internal: From the time when RunCrankActive until ActualRange AND Accessory/Wakeup	= Good value = Park =False =False =True = True =True =Park =False	10,000.00 msec from Reverse 10,000.00 msec from Neutral 10,000.00 msec from Drive	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Unable to Engage Drive	P07E5	Detects the failure to achieve the expected command to Drive range.	Actual Arbitrated Transmission Range	≠Drive	Actual Transmission Range Commanded Transmission Range AND CodeClearFunction AND ManufacturingModeActive AND: External: Run/Crank OR Accessory/Wakeup Internal: From the time when RunCrankActive until ActualRange AND Accessory/Wakeup	= Good value = Drive =False =False =True = True =True =Park =False	10,000.00 msec from Park 10,000.00 msec from Reverse 10,000.00 msec from Neutral	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever X Position Sensor 1 Circuit Range/ Performance	P082A	Detects Gear Lever X Position Sensor 1 circuit is reading outside "good" values	Gear Lever Position Sensor 1 Measured Duty Cycle on X OR Gear Lever Position Sensor 1 Frequency error detection flag on X OR Gear Lever Position Sensor 1 Measured Duty Cycle on X and Gear Lever Position Sensor 2 Measured Duty Cycle on X differ by more than	Are outside the shifter path of movement 5.5% to meet 100 Nm force on shifter from nominal path OR = True > 12.00 %	Not Fault Active Controller has been awake for at least	P082B, P082C 0.05 seconds	3.00 failures out of 4.00 samples 25ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever X Position Sensor 1 Circuit Low	P082B	Detects Gear Lever X Position Sensor 1 circuit reading low	Gear Lever Position Sensor 1 Measured Duty Cycle on X	< 5.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Detects Gear Lever X Position Sensor 1 circuit reading high	P082C	Gear Lever Position Sensor 1 Measured Duty Cycle on X	Gear Lever Position Sensor 1 Measured Duty Cycle on X	> 95.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever Y Position Sensor 1 Circuit Performance	P082D	Detects Gear Lever Y Position Sensor 1 circuit is reading outside "good" values	Gear Lever Position Sensor 1 Measured Duty Cycle on Y OR Gear Lever Position Sensor 1 Frequency error detection flag on Y OR Gear Lever Position Sensor 1 Measured Duty Cycle on Y and Gear Lever Position Sensor 2 Measured Duty Cycle on Y differ by more than	Are outside the shifter path of movement 5.5% to meet 100 Nm force on shifter from nominal path = True > 12.00 %	Not Fault Active Controller has been awake for at least	P082E, P082F 0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever Y Position Sensor 1 Circuit Low	P082E	Detects Gear Lever Y Position Sensor 1 circuit reading low	Gear Lever Position Sensor 1 Measured Duty Cycle on Y	< 5.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever Y Position Sensor 1 Circuit High	P082F	Detects Gear Lever Y Position Sensor 1 circuit reading high	Gear Lever Position Sensor 1 Measured Duty Cycle on Y	> 95.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever X Position Sensor 2 Circuit Performance	P089B	Detects Gear Lever X Position Sensor 2 circuit is reading outside "good" values	Gear Lever Position Sensor 2 Measured Duty Cycle on X OR Gear Lever Position Sensor 2 Frequency error detection flag on X OR Gear Lever Position Sensor 2 Measured Duty Cycle on X and Gear Lever Position Sensor 1 Measured Duty Cycle on X differ by more than	Are outside the shifter path of movement 5.5% to meet 100 Nm force on shifter from nominal path = True > 12.00 %	Not Fault Active Controller has been awake for at least	P089C, P089D 0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever X Position Sensor 2 Circuit Low	P089C	Detects Gear Lever X Position Sensor 2 circuit reading low	Gear Lever Position Sensor 2 Measured Duty Cycle on X	< 5.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever X Position Sensor 2 Circuit High	P089D	Detects Gear Lever X Position Sensor 2 circuit reading high	Gear Lever Position Sensor 2 Measured Duty Cycle on X	> 95.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever Y Position Sensor 2 Circuit Performance	P08A0	Detects Gear Lever Y Position Sensor 2 circuit is reading outside "good" values	Gear Lever Position Sensor 2 Measured Duty Cycle on Y OR Gear Lever Position Sensor 2 Frequency error detection flag on Y OR Gear Lever Position Sensor 1 Measured Duty Cycle on Y and Gear Lever Position Sensor 2 Measured Duty Cycle on Y differ by more than	Are outside the shifter path of movement 5.5% to meet 100 Nm force on shifter from nominal path = True > 12.00 %	Not Fault Active Controller has been awake for at least	P08A1, P08A2 0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever Y Position Sensor 2 Circuit Low	P08A1	Detects Gear Lever Y Position Sensor 2 circuit reading low	Gear Lever Position Sensor 2 Measured Duty Cycle on Y	< 5.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Gear Lever Y Position Sensor 2 Circuit High	P08A2	Detects Gear Lever Y Position Sensor 2 circuit reading high	Gear Lever Position Sensor 2 Measured Duty Cycle on Y	> 95.00 %	Controller has been awake for at least	0.05 seconds	3.00 failures out of 4.00 samples 25 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Signal Message Counter Incorrect	P1100	This DTC monitors for an error in communication with the Fuel Pump Control Module (FTZM) Fuel Level Sensor 2 Signal Message Counter	Communication of the Fuel Level Sensor 2 Signal Message Counter from the Fuel Pump Control Module (FTZM) over CAN bus is incorrect for out of total samples	>= 8 counts >= 10 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage Sensor Bus Relay	= Is available >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts = On (if present)	Executes in 10ms loop.	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Pump Driver Control Module Fuel Level Sensor 2 Internal Supply Circuit	P1179	This DTC monitors for an error in the Fuel Pump Driver Control Module Fuel Level Sensor 2 Internal Supply Circuit	Raw Fuel Pump Driver Control Module Fuel Level Sensor 2 Internal Supply Circuit is or Raw Fuel Pump Driver Control Module Fuel Level Sensor 2 Internal Supply Circuit is or Absolute difference of the filtered Fuel Pump Driver Control Module Fuel Level Sensor 2 Internal Supply Circuit and Raw Fuel Pump Driver Control Module Fuel Level Sensor 2 Internal Supply Circuit is For a non-continuous failure of out of For a continuous failure of	> 92.25 Percent < 87.75 Percent > 0.90 Percent 40.00 counts 80.00 counts 0.20 seconds	Diagnostic is enabled Run/Crank Ignition Voltage U0076 PT Sensor Bus Relay Communication with the Fuel Tank Zone Module is not lost	1.00 (1 indicates enabled) >= 11.00 Volts Is not active Commanded on	Executes in 50.0ms loop.	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 B Reference Feedback Range/ Performance [For use on vehicles with FTZM and Secondary Fuel Tank]	P143E	This DTC will detect a fault in Secondary fuel tank level sensor 5V reference by comparing DEC ECU commanded signal period and pulse width values against measured period and pulse width reported by the smart device	Reference Voltage 1 Period Error Maximum [Measured Ref V Period - Commanded Ref V Period]	> 25.00 millisec	a] CAN serial data available [$2D7] b] Calibration - Reference Voltage Command Source c] Timer - Reference Voltage Pulse Width Available Synchronization d] Timer - Reference Voltage Period Available Delay e] Diagnostic System Disabled f] FTZM Serial Data Info4 Rolling Counter Check Error g] Reference Voltage Performance 1 Diagnostic Enabled	a] == True b] == ECM c] > 1.25 sec d] > 0.75 sec e] <> True f] <> True g] == TRUE	250 ms / sample 16 Failures / 20 Samples	Type B, 2 Trips
			Reference Voltage 1 Pulse Width Error Maximum [Measured Ref V PW - Commanded Ref V PW]	> 1.50 millisec	a] CAN serial data available [$2D7] b] Calibration - Reference Voltage Command Source c] Timer - Reference Voltage Pulse Width Available Synchronization d] Timer - Reference Voltage Period Available Delay e] Diagnostic System Disabled	a] == True b] == ECM c] > 1.25 sec d] > 0.75 sec e] <> True	250 ms / sample 16 Failures / 20 Samples	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					f] FTZM Serial Data Info4 Rolling Counter Check Error g] Reference Voltage Performance 1 Diagnostic Enabled	f] <> True g] == TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Adaptive Cruise Control Signal Circuit	P1553	Detects rolling count or protection value errors in Adaptive Cruise Control Axle Torque Command serial data signal "Neutral Default State - When the ECM determines that a serial communication fault has occurred with the EOCM or the ACC module in data frame $2CB, the code is set and the Adaptive Control Cruise is disabled." Only applicable for applications with ACC feature.	If x of y rolling count / protection value faults occur, disable adaptive cruise control for duration of fault		Adaptive Cruise Control Command Serial Data Error Diagnostic Enable	1.00	9 / 17 counts	Type C, No SVS , "Emissions Neutral Diagnostics – special type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Auto Start Stop Select Switch Signal Circuit For start stop conventional hybrid applications	P15A3	BCM to ECM Rolling Count check for CAN frame $1E1. -- Only utilize when calibration variable KeINFG_e_HybridType equals CeINFR_e_StartStopConv.	Rolling count value received from BCM does not match expected value	= TRUE	Engine Speed Engine Speed Engine speed between min/max for Vehicle Speed for Hybrid type	≥ 200 RPM ≤ 7,500 RPM ≥ 5.0 seconds ≤ 318.14 MPH ≥ 5.0 seconds =CeINFR_e_StartStopConv	> 3 error counts for > 10.0 seconds 100 ms / sample	Type C, No SVS

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal Control Module Transmission Range Control Performance	P16F4	Determines if the Electronic Transmission Range Select control module software incorrectly processes a range request which would result in an unsafe condition	Driver Requested Arbitrated Range Commanded OR: Transmission range control routine Transmission range control routine Transmission range control routine	is issued unexpectedly OR ≠ expected range Does not issue Park or Neutral command quickly enough in response to driver request Issues a request to Drive, Low or Manual without a matching input by the customer within a calibrated time T1. Issues a request to Reverse without a matching input by the customer within a calibrated time limit T2.	TRCR Global Diagnostic Enable CodeClearFunction AND ManufacturingModeActive AND: External: Run/Crank OR Accessory/Wakeup Internal: From the time when RunCrankActive until ActualRange AND Accessory/Wakeup	= True =False =False =True = True =True =Park =False	200 , 200 , 200 , 2,050 , 200 or 200 msec, depending on conditions. T1 = 200 msec T2 = 200 msec	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Powerflow Engaged Signal Message Incorrect	P1772	Detects error on ARC & PV reported by CHCM/ ECM about signal $197 from TCM on HS GMLAN	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Battery voltage A diagnostic code clear event or diagnostic re-enable event is not in progress for:	within proper operating range for at least 3,000 msec for a time > 3,000 msec	8 failures out of 10 samples 12.5 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
IMS State Signal Message Incorrect	P1773	Detects error on ARC & PV reported by CHCM/ ECM about signal $197 from TCM on HS GMLAN	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Battery voltage A diagnostic code clear event or diagnostic re-enable event is not in progress for:	within proper operating range for > 3,000 msec for a time > 3,000 msec	8 failures out of 10 samples 12.5 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Availability Signal Message Incorrect	P1778	Detects error on ARC & PV reported by CHCM / ECM about signal $3F5 from TCM on HS GMLAN	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Battery voltage A diagnostic code clear event or diagnostic re-enable event is not in progress:	within proper operating range for 3,000 msec for a time > 3,000 msec	8 failures out of 10 samples Signal in the 250 ms loop	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Unexpected Range Change Detected	P1787	Detects an unexpected change in transmission range.	Actual Arbitrated Transmission Range The internal system only diagnoses range changes in and out of Park.	≠ Previous Value	Actual Tranmission Range Range Change Achievement Diag	= Good value = Not running	1,500 ms	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Current Transmission Range Unknown	P1789	Detects the failure of the ETRS system to identify the current transmission range with sufficient confidence.	Actual Transmission Range	= Undefined	Range Indication Source AND CodeClearFunction AND ManufacturingModeActive AND: External: Run/Crank OR Accessory/Wakeup Internal: From the time when RunCrankActive until ActualRange AND Accessory/Wakeup	= Valid =False =False =True = True =True =Park =False	80 failures out of 100 samples 12.5 ms loop	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch A Circuit Low	P17A3	Detects Selector Enable Switch A circuit reading low	Shift Enable Switch Measured Voltage Percent	< Low 446 counts 1023 counts = 5 Volts			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Default Action, Type C, No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch A Circuit High	P17A4	Detects Selector Enable Switch A circuit reading high	Selector Enable Switch Measured Voltage Percent	> High = 853 counts 853 counts = 83.3% of 5 Volts. 1023 Counts = 5 V			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch A Circuit Performance	P17A5	Detects Selector Enable Switch A circuit reading outside "Released" or "Pressed" values	Selector Enable Switch Measured Voltage	(544<X<753 counts) 53.2% < X < 73.7% of 5 Volts. 1023 Counts = 5 V	Not Fault Active	P17A4, P17A3	100 Failures out of 120 Samples =500 msec (SIB is 5 msec loop)	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch A/B Correlation	P17A6	Correlation diagnosic compares both switches	Measured Voltage Percent of Selector Enable Switch A and Switch B	Are both VALID, (Release or Pressed), but disagree. Pressed: 49% - 61% Released: 70% - 82%	Interlock comparison diagnostic enabling calibration = The controller has been awake for at least:	1.00 =0.05 seconds	12.5 ms rate 24,000.00 failures out of 24,000.00 samples	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch B Circuit Low	P17A7	Detects Selector Enable Switch B circuit reading low	Selector Enable Switch Measured Voltage	< Low 446 counts 446 counts = 43.6% of 5 Volts. 1023 Counts = 5 V			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch B Circuit High	P17A8	Detects Selector Enable Switch B circuit reading high	Selector Enable Switch Measured Voltage	> High 853 counts 853 counts = 83.3% of 5 Volts. 1023 Counts = 5 V			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch B Circuit Performance	P17A9	Detects Selector Enable Switch B circuit reading outside "Released" or "Pressed" values	Selector Enable Switch Measured Voltage	(544<X<753 counts) 53.2% < X < 73.7% of 5 Volts. 1023 Counts = 5 V	Not Fault Active	P17A8, P17A7	100 Failures out of 120 Samples =500 msec (SIB is 5 msec loop)	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selection Signal Message Counter Incorrect	P17D7	ARC & PV reported SIB for $1E8 signal from the ECM on Powertrain Sensor CAN BusDetects the failure of the ETRS system to identify the current transmission range with sufficient confidence.	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Ignition	Run or Run/Crank	1 second	Type B two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Memory Checksum Error	P17D8	[1] This DTC will be stored if any software or calibration check sum is incorrect. [2] Circuit Monitor mismatch occurs	[1] Calculated Checksum [2] Switch circuit calculated values:	≠ stored checksum for any of the parts (boot, software, application calibration, system calibration) ≠ switch circuit monitor values	Ignition OR Accessory	Run or Run/Crank ON	[1] 1 failure if it occurs during the first ROM test of the ignition cycle, otherwise 5 failures Frequency: Runs continuously in the background [2] Test runs during calculation of switch circuit values	Type A one trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Read Only Memory (ROM) Error	P17D9	Reports a failure if the BIST (=Built in Self Test) for [1] the ROM checksum or [2] the ROM Error correcting code (ECC) check fails.	[1] Checksum at power-up [2] ROM ECC	≠ checksum at power-down = fault	Ignition OR Accessory:	Run or Run/Crank ON	[1] 1 failure Frequency: Once at power-up [2] 1 failure Frequency: Runs continuously in the background	Type A 1 trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Internal Random Access Memory (RAM) Error	P17DA	Indicates that control module is unable to correctly write and read data to and from RAM.	Data read	≠ Data written	Ignition: OR Accessory	Run or Run/Crank ON	1 failure if it occurs during the first RAM test of the ignition cycle, otherwise 5 failures This test runs continuously in the background	Type A one trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Processor	P17DB	Indicates the ECU has detected an internal processor fault. This DTC is dependent on the microprocessor and includes self testing not listed. [1] Microprocessor ALU Integrity Diagnostic Monitor Algorithm [2] Main Processor Configuration Register Test [3] Seed and Key fault (Set by ECM when seeds and keys do not match) [4] Stack overflow [5] Program Counter Exception Error [6] Watchdog Fails to reset	[1] Calculated key from rolling seed [2] Processor register [3] <This test has no threshold value.> [4] Unused stack memory above maximum stack used [5] Illegal instruction loaded into program counter [6] Set when a fault that should cause a reset fails to cause a reset.	[1] ≠ expected key [2] ≠ expected processor register value [3] No threshold value [4] ≠ initialized special pattern [5] No threshold value [6] No threshold value	For all six cases: Ignition Accessory	For all six cases: Run or Run/Crank OR ON	[1] 1 failure Test runs continuously (20ms loop or less) [2] 1 failure Test runs continuously (20ms loop or less) [3] 1 failure Test runs continuously (25ms loop or less) [4] 1 failure Test run by OS on task switches [5] 1 failure [6] 1 failure	Type A 1 trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Ignition On/ Start Switch Circuit Low	P17E0	Detects if the Ignition1 Switch circuit is shorted to low or open	Ignition 1 voltage	<= 6 V	Engine Controller Run Crank Terminal Status - CAN Message	= 1 indicating RUN/ CRANK	4.5 sec in 5.5 second window	Type B two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Ignition On/ Start Switch Circuit High	P17E1	Detects if the Ignition1 Switch circuit is shorted to vehicle supply voltage	Ignition 1 voltage	> 11.7 V	Engine Controller Run Crank Terminal Status - CAN Message	= 0, indicating NOT RUN/CRANK	4.5 sec in 5.5 second window	Type B two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Switch A/B Circuit Stuck On	P17F3	Checks if both switches have been pressed for a long time	Park Position is PRESSED	≥ 60.00 seconds	Not Fault Active Controller is "on"	P07B3, P07B4, P07B4, P07B9, P07BA, P07BB >~ 100 ms	1.00 failures out of 1.00 samples	DTC Type B Two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Enable Switch A/B Circuit Stuck On	P17F4	Checks if switch has been pressed for a long time. Note: The DTC routine for this DTC is in the SIB, but the calibrations are in the ECM. Checks if both switches have been pressed for a long time	Enable Switch A or B are PRESSED	≥ 600.00 seconds	KeESDR_b_IntrlckStuckDiagEnbl = Controller is	True "On"	1.00 failures out of 1.00 samples	Emissions Neutral Default Action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Signal Message Counter Incorrect	P188B	This DTC monitors for an error in communication with the Transmission Range Signal	Communication of the Alive Rolling Count or Protection Value of the Transmission Range Signal over CAN bus is incorrect for out of total samples	 >= 8.00 counts >= 10.00 counts	Message frame All the following conditions are met for Power Mode Powertrain Relay Voltage Run/Crank Ignition Voltage	= Is avaialble >= 3,000.00 milliseconds = Run >= 11.00 Volts >= 11.00 Volts	Executes in 250ms loop.	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Position Switch A/B Circuit Stuck Off	P189D	Compares Park Switch A and Park Switch B "PRESSED" and "RELEASED" states	When either is “PRESSED” for 100 ms then pressed event is entered. Fault is incremented if other switch	 Is not pressed during event.	Not Fault Active Controller is on Park button switches Vehicle Speed	P07B3, P07B4, P07B5, P07B9, P07BA, P07BB >~100 ms =valid <= Park Request Spd	7 synchronized failures in a row. *note: these samples can accumulate over key-cycles	DTC Type B, Two trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Primary Signal Message Counter Incorrect	P189E	Monitor $1EC CAN frame from SIB LS and set a DTC: P189E that indicates an ARC or ChkSum error from the $1EC CAN frame persists long enough to satisfy fail criteria. Linear shifter.	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value Compares Park Switch A and Park Switch B "PRESSED" and "RELEASED" states.	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Battery voltage A diagnostic code clear event or diagnostic re-enable event is not in progress for:	within proper operating range for 3,000 msec for a time 3,000 msec	sampled in the 12.5 ms loop 8 failures out of 10 samples	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Secondary Signal Message Counter Incorrect	P189F	Monitor $2EC CAN frame from SIB LS and set a DTC: P189F that indicates an ARC or ChkSum error from the $2EC CAN frame persists long enough to satisfy fail criteria. Linear shifter.	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value Compares Park Switch A and Park Switch B "PRESSED" and "RELEASED" states.	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Battery voltage A diagnostic code clear event or diagnostic re-enable event is not in progress for:	within proper operating range for 3,000 msec for a time 3,000 msec	sampled in the 12.5 ms loop 8 failures out of 10 samples	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Performance (For use on vehicles with dual fuel tanks and electric transfer pump)	P2066	This DTC will detect a secondary fuel tank level sensor stuck in-range	1. ****************************** Fuel Level in Primary and Secondary Tanks Remains in an Unreadable Range too Long ****************************** 1a) If Deadband diagnostic subtest enabled AND 1b) If fuel volume in primary tank is 1c) and if fuel volume in secondary tank is 1d) and if 1b and 1c indications do not change while fuel volume consumed by engine is OR 2. ****************************** During fuel transfer ****************************** 2a) After expiration of fuel sloshing delay time, 2b) If minimum fuel transferred from the secondary tank is 2c) and if minimum fuel transferred into the primary tank is 2d) within time OR 3. ******************************	1a) == Disabled status 1b) ≥ 1,024.0 liters 1c) < 2.7 liters 1d) >= 18.0 liters 2a) >= 20.00 seconds 2b) > 10.00 liters 2c) < 10.00 liters 2d) <= 420.00 seconds	1a) Diagnostic Enabled 1b) Engine Operational Status 2) Secondary tank volume [Not Full] 3) Secondary Fuel Transfer Pump On Time 4a) Vehicle Speed signal Faulted 4b) Serial Data communication Faulted	1a) == True 1b) == Running 2) < 10 liters 3) ≥ 600 seconds 4a) <> True 4b) <> True	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.
			After a Refuel Event ****************************** 3a) If primary tank volume change from Engine Off to next Engine On condition is 3b) then secondary tank volume change must be OR 4. ****************************** Fuel consumed without a Secondary Fuel Level Change ****************************** 4a) If engine is running, and the fuel consumed is 4b) then secondary tank volume change must be OR 5. ****************************** Secondary Tank Full Indication Stuck During Fuel Transfer ****************************** 5a) If secondary tank fuel level [Full definition] is AND 5b) If engine is running, and fuel consumed is 5c) then secondary tank volume change must be	3a) >= 20.00 liters 3b) >= 3.00 liters 4a) >= 16 liters 4b) >= 3.00 liters 5a) > 10 liters 5b) >= 16 liters 5c) >= 3.00 liters				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Circuit Low Voltage (For use on vehicles with dual fuel tanks)	P2067	This DTC will detect a fuel sender stuck out-of-range low in the secondary fuel tank.	Fuel level Sender % of 5V range	< 10 % or 23.91 liters	a) Diagnostic enabled status b) Fuel Level Sensor Initialized status c) Fuel Level Sensor Data Available Status d) Communication faults status	a) == True b) == True c) == True d) <> True	100 failures out of 125 samples 100 ms / sample	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Fuel Level Sensor 2 Circuit High Voltage (For use on vehicles with dual fuel tanks)	P2068	This DTC will detect a fuel level sensor stuck out-of-range high in the secondary fuel tank.	Fuel level Sender % of 5V range	> 60 % or 1.70 liters	a) Diagnostic enabled status b) Fuel Level Sensor Initialized status c) Fuel Level Sensor Data Available Status d) Communication faults status	a) == True b) == True c) == True d) <> True	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.
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.
Crankshaft Position Signal Output Circuit High	P2619	Controller specific output driver circuit diagnoses the crankshaft position 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.	Short to power: <= 0.5 Ohms impedance between signal and controller power	Powertrain Relay Voltage Engine is not cranking Crankshaft Position Output is commanded low	>= 11.0 Volts	40 failures out of 50 samples 1 sample every 100 msec	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication With Cruise Control Module	U0104	This DTC monitors for a loss of communication with the Cruise Control Module. Emission neutral default state is disable Adaptive Cruise Control.	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type C, No SVS "Emissions Neutral Diagnostics – Type C"
					U0073	Not Active on Current Key Cycle		
			Message $2CB	≥ 500.00 milliseconds				
			Message $2CD	≥ 500.00 milliseconds	Normal CAN transmission on Bus A	Enabled		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U0104	Not Active on Current Key Cycle		
					Cruise 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 Differential Control Module Rear	U0136	This DTC monitors for a loss of communication with the Differential Control Module Rear	Message is not received from controller for		General Enable Criteria:		Diagnostic runs in 12.5 ms loop	Type B, 2 Trips
			Message $1CF	≥ 10,000.00 milliseconds	U0073	Not Active on Current Key Cycle		
					Normal CAN transmission on Bus A	Enabled		
					The following criteria have been enabled for	>= 3,000.00 milliseconds		
					Transition from accessory mode to off is pending	= False		
					Battery Voltage	> 11.00 Volts		
					Ignition Voltage Criteria:			
					Power Mode	= Run		
					Run/Crank Voltage	>= 11.00 Volts		
					Off Cycle Enable Criteria:			
					KeCMGD_b_OffKeyCycleDiagEnbl	0.00 (1 indicates enabled)		
					KeDFIR_e_OBD_ControllerType is an OBD Controller	OBD Controller		
					Controller shutdown impending	= False		
					Power Mode	= Not Run/Crank		
					U0136	Not Active on Current Key Cycle		
					RDCM	is present on the bus		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Invalid Data Received From Body Control Module	U0422	Signal between the BCM and door switches is unreliable	Driver Door Ajar Switch Virtual Device Availability OR Driver Door Open Switch Virtual Device Availability	= INVALID = INVALID	Battery voltage A diagnostic code clear event or diagnostic re-enable event is not in progress for	within proper operating range for 3,000 msec. for a time 3,000 msec.	12.5 ms loop 8 failures out of 10 samples.	Emissions-neutral default action, Type C No MIL

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Transmission Control Module on Engine Control Module LIN Bus 1	U135E	Detects that LIN serial data communication has been lost with the LIN Bus	TCM to ECM: Message $01 Bus Status	= Undetected	Controller On Ignition	> 3,000 ms = Run/Crank OR = Accessory	1.0 second	DTC Type B Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Lost Communication with Engine Control Module on Powertrain Sensor CAN Bus	U18C6	Detects that CAN serial data communication has been lost with the ECM.	Powertrain Sensor Bus Message $1E2 OR $1E8	=Undetected	Ignition Run/Crank Voltage Ignition	11V < RC Volt < 32V = Run/Crank OR = Accessory	1.0 second	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Transmission Range Selector Control Module on Powertrain Sensor CAN Bus	U18D2	Detects that CAN serial data communication has been lost with the SIB on the Powertrain (NOX) Sensor Bus	$2F3, $4C4, $1EC	=Undetected	Controller On Ignition	> 3,000 ms = Run/Crank OR = Accessory	Messages: $2F3, $1EC: 1.0 second Message $4C4: 10 seconds	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lost Communication with Transmission Range Selector Control Module on Powertrain Expansion CAN Bus	U18D3	Detects that CAN serial data communication has been lost with the SIB PT Exp Bus	TRS Buttons Message: $2C2 TRS Linear Shifter Message: $2EC	=Undetected	Controller On Ignition	> 3,000 ms = Run/Crank OR = Accessory	1.0 second	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Powertrain Expansion CAN Bus Off	U240D	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state	Powertrain Expansion Bus Status	= off	Ignition	= Run or Run/Crank	1 second	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Selector Control Module Powertrain Sensor CAN Bus Off	U240E	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state	Powertrain Sensor Bus Status	=off	Ignition=	Run or Run/Crank	1 second	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Invalid Data Received From Transmission Control Module to Electronic Transmission Control Module on LIN BUS.	U250D	Detects if Range Command Echo from TCM matches current Range Command (For Internal ETRS only)	Check Range Command Echo vs Range Command when Range Command Poke is called	Range Command Echo ≠ Range Command	Diagnostic Enable Calibration Recent Range Command Transition TCM LIN Node or Bus Fault Active	= TRUE = FALSE = FALSE	80 failures out of 100 samples 50 ms loop	DTC Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-Function Input B Circuit	P0589	Detect when cruise control multi-function switch circuit B (analog) voltage is in an illegal range "Neutral Default State - When the BCM tells the ECM that the cruise switch for the secondary cruise switch circuit is detected Out of Range for too long, the code is set and cruise control is disabled." Only applicable for applications with a secondary cruise switch circuit.	Cruise Control analog circuit B voltage must be "between ranges" for greater than a calibratable period of time.	The cruise control analog voltage A/D count ratio is considerred to be "between ranges" when the ratio is measured in the following ranges: 0.28 -0.31, 0.415-0.445, 0.585 - 0.615, 0.78 - 0.81, 1.005 - 1.035	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 0.500 seconds	Type C, No SVS , "Emissions Neutral Diagnostics – special type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-Function Input B Circuit Low	P0592	detects short to ground failure for cruise multi-function switch circuit B. "Neutral Default State - When the BCM tells the ECM that the cruise switch for the secondary cruise switch circuit is detected too low for too long, the code is set and cruise control is disabled." Only applicable for applications with a secondary cruise switch circuit.	Cruise Control analog circuit B voltage must be in an "Open Short To Ground" range for greater than a calibratable period of time.	The cruise control Circuit B analog voltage A/D count ratio is considered to be "open short to groun"d when the ratio is measured in the following rangs: 0 - 0.185	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 2.00 seconds	Type C, No SVS ,"Emissions Neutral Diagnostics – special type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Multi-Function Input B Circuit High	P0593	detects short to power failure for cruise multi-function switch circuit B "Neutral Default State - When the BCM tells the ECM that the cruise switch for the secondary cruise switch circuit is detected too high for too long, the code is set and cruise control is disabled." Only applicable for applications with a secondary cruise switch circuit.	Cruise Control analog circuit B voltage must be in a "Short To Power" range for greater than a calibratable period of time.	The cruise control Circuit B analog voltage A/D count ratio is considered to be "short to power" when the ratio is measured in the following range: 1.005 - 1.035	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 2.00 seconds	Type C, No SVS , "Emissions Neutral Diagnostics – special type C"

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 diagnostic is monitoring that the TCM is processing code correctly. The TCM computes the correct pattern sent via a CAN message to the monitoring ECM. When the ECM does not receive a correct pattern or a missing pattern to the monitoring ECM, the DTC is set.	Received pattern from the TCM OR Received malfunction pattern	≠ expected pattern >= 2 counts	Run or Crank Run Crank Active Time	 >= 0.50 seconds	6 / 12 counts or 2.00 seconds continuous; 25 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.
Cruise Control Set/ Coast Signal 2 Circuit	P155B	Detects a failure of the cruise set 2 switch in a continously applied state "Neutral Default State - When the BCM tells the ECM that the secondary cruise control switch circuit voltage is stuck in Decrease High state for too long, the code is set and cruise control is disabled." Only applicable for applications with the secondary cruise switch circuit.	Cruise Control Set 2 switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 89.000 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 89.000 seconds	Type C, No SVS , "Emissions Neutral Diagnostics – special type C"

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Cruise Control Resume/ Acceleration Signal 2 Circuit	P155C	Detects a failure of the cruise resume 2 switch in a continously applied state "Neutral Default State - When the BCM tells the ECM that the secondary cruise control switch circuit voltage is stuck in Increase High state for too long, the code is set and cruise control is disabled." Only applicable for applications with the secondary cruise switch circuit.	Cruise Control Resume 2 switch remains applied for greater than a calibratable period of time.	fail continuously in the applied state for greater than 89.000 seconds	CAN cruise switch diagnostic enable in ECM	1.00	fail continuously for greater than 89.000 seconds	MIL: Type C, No SVS , "Emissions Neutral Diagnostics – special type C"

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	7	7	7	7	7	7	7	7	15	15	15	15	15	15	15	15

Initial Supporting table - Multiple DTC Use_Green Sensor Delay Criteria - Limit

Description: This Calibration is the acculmulated airflow limit above which the Green condition is expired
Used for: P0133, P013A, P013B, P013C, P013D, P013E, P013F, P014A, P014B, P0153, P015A, P015B, P015C, P015D, P1133, P1153, P2270, P2271, P2272 and P2273.
Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.

Value Units: Grams
X Unit: Acculmulated Engine Airflow

y/x	CiOXYR_O2_Bank1_Sensor1	CiOXYR_O2_Bank1_Sensor2	CiOXYR_O2_Bank2_Sensor1	CiOXYR_O2_Bank2_Sensor2
1	120,000	120,000	120,000	120,000

Initial Supporting table - P0011_CamPosErrorLimIc1

Description: Maximum Intake Cam 1 phase error as a function of engine speed and engine oil temperature.

Value Units: Maximum Intake Cam 1 phase error (degCAM)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	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	6.0
800	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	6.0
1,200	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	6.0
1,600	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	6.0
2,000	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	6.0
2,400	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	6.0
2,800	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	6.0
3,200	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	6.0
3,600	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	6.0
4,000	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	6.0
4,400	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	6.0
4,800	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	6.0
5,200	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	6.0
5,600	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	6.0
6,000	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	6.0
6,400	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	6.0
6,800	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	6.0

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	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
3,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
3,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Initial Supporting table - 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	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	6.0
800	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	6.0
1,200	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	6.0
1,600	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	6.0
2,000	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	6.0
2,400	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	6.0
2,800	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	6.0
3,200	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	6.0
3,600	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	6.0
4,000	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	6.0
4,400	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	6.0
4,800	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	6.0
5,200	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	6.0
5,600	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	6.0
6,000	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	6.0
6,400	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	6.0
6,800	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	6.0

Initial Supporting table - P0014_P05CE_StablePositionTimeEc1

Description: Minimum time for Exhaust Cam 1 phase position to be stable to enable performance diagnostic.

Value Units: Minimum time (sec)
X Unit: Engine Oil Temperature (degC)
Y Units: Engine Speed (rpm)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
2,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
3,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
3,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5,200	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5,600	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,000	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,400	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6,800	100.0	80.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Initial Supporting table - 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	25	10	7	5	3	1	1	1	1	1	1	1	1	1	1	1	1

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 - P00C4 P2261: Compressor Surge Line

Description: Turbo compressor recirculation valve diagnosis surge area limit.

Value Units: [ratio] CRV diagnosis surge area limit.
X Unit: [g/sec[] KnBSTD_dm_AirFlowBP - Air FLow

y/x	0.00	28.95	76.66	185.00	215.90	254.00
1	1.000	1.364	2.362	2.690	2.995	3.780

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

Description: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix - This table describes combinations of individual model failures that will set P0101, P0106, P010B, P0121, P0236 and P1101 on turbocharged applications.

Value Units: Boolean
X Unit: Unitless (See top line for heading information)
Y Units: Unitless

y/x	1	2	3	4	5	6	7	8	9
1	MAF Model	MAP1 Model	MAP2 Model	MAP3 Model	TIAP1 Model	TPS Model	TIAP Correlation	TIAP Correlation	DTC Set
2	Failed	Failed	Failed	Failed	Failed	Failed	Failed	Valid	
3	F	F	F	F	F	F	F	F	No DTC
4	F	F	F	F	F	F	F	T	No DTC
5	F	F	F	F	F	F	T	F	No DTC
6	F	F	F	F	F	F	T	T	No DTC
7	F	F	F	F	F	T	F	F	No DTC
8	F	F	F	F	F	T	F	T	No DTC
9	F	F	F	F	F	T	T	F	No DTC
10	F	F	F	F	F	T	T	T	No DTC
11	F	F	F	F	T	F	F	F	No DTC
12	F	F	F	F	T	F	F	T	No DTC
13	F	F	F	F	T	F	T	F	No DTC
14	F	F	F	F	T	F	T	T	No DTC
15	F	F	F	F	T	T	F	F	P1101
16	F	F	F	F	T	T	F	T	P0121
17	F	F	F	F	T	T	T	F	P1101
18	F	F	F	F	T	T	T	T	P0236
19	F	F	F	T	F	F	F	F	No DTC
20	F	F	F	T	F	F	F	T	P1101
21	F	F	F	T	F	F	T	F	P1101
22	F	F	F	T	F	F	T	T	P1101
23	F	F	F	T	F	T	F	F	P1101
24	F	F	F	T	F	T	F	T	P1101
25	F	F	F	T	F	T	T	F	P1101
26	F	F	F	T	F	T	T	T	P1101
27	F	F	F	T	T	F	F	F	P1101
28	F	F	F	T	T	F	F	T	P1101
29	F	F	F	T	T	F	T	F	P1101
30	F	F	F	T	T	F	T	T	P1101
31	F	F	F	T	T	T	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

32	F	F	F	T	T	T	F	T	P1101
33	F	F	F	T	T	T	T	F	P1101
34	F	F	F	T	T	T	T	T	P1101
35	F	F	T	F	F	F	F	F	No DTC
36	F	F	T	F	F	F	F	T	P1101
37	F	F	T	F	F	F	T	F	P1101
38	F	F	T	F	F	F	T	T	P1101
39	F	F	T	F	F	T	F	F	P1101
40	F	F	T	F	F	T	F	T	P1101
41	F	F	T	F	F	T	T	F	P1101
42	F	F	T	F	F	T	T	T	P1101
43	F	F	T	F	T	F	F	F	P1101
44	F	F	T	F	T	F	F	T	P1101
45	F	F	T	F	T	F	T	F	P1101
46	F	F	T	F	T	F	T	T	P1101
47	F	F	T	F	T	T	F	F	P1101
48	F	F	T	F	T	T	F	T	P1101
49	F	F	T	F	T	T	T	F	P1101
50	F	F	T	F	T	T	T	T	P1101
51	F	F	T	T	F	F	F	F	P1101
52	F	F	T	T	F	F	F	T	P1101
53	F	F	T	T	F	F	T	F	P1101
54	F	F	T	T	F	F	T	T	P1101
55	F	F	T	T	F	T	F	F	P1101
56	F	F	T	T	F	T	F	T	P1101
57	F	F	T	T	F	T	T	F	P1101
58	F	F	T	T	F	T	T	T	P1101
59	F	F	T	T	T	F	F	F	No DTC
60	F	F	T	T	T	F	F	T	No DTC
61	F	F	T	T	T	F	T	F	No DTC
62	F	F	T	T	T	F	T	T	No DTC
63	F	F	T	T	T	T	F	F	P1101
64	F	F	T	T	T	T	F	T	P1101
65	F	F	T	T	T	T	T	F	P1101
66	F	F	T	T	T	T	T	T	P1101
67	F	T	F	F	F	F	F	F	No DTC
68	F	T	F	F	F	F	F	T	P1101
69	F	T	F	F	F	F	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

70	F	T	F	F	F	F	T	T	P0236
71	F	T	F	F	F	T	F	F	P1101
72	F	T	F	F	F	T	F	T	P0121
73	F	T	F	F	F	T	T	F	P1101
74	F	T	F	F	F	T	T	T	P0236
75	F	T	F	F	T	F	F	F	P1101
76	F	T	F	F	T	F	F	T	P1101
77	F	T	F	F	T	F	T	F	P1101
78	F	T	F	F	T	F	T	T	P0236
79	F	T	F	F	T	T	F	F	P1101
80	F	T	F	F	T	T	F	T	P0121
81	F	T	F	F	T	T	T	F	P1101
82	F	T	F	F	T	T	T	T	P0236
83	F	T	F	T	F	F	F	F	P1101
84	F	T	F	T	F	F	F	T	P1101
85	F	T	F	T	F	F	T	F	P1101
86	F	T	F	T	F	F	T	T	P1101
87	F	T	F	T	F	T	F	F	P1101
88	F	T	F	T	F	T	F	T	P1101
89	F	T	F	T	F	T	T	F	P1101
90	F	T	F	T	F	T	T	T	P1101
91	F	T	F	T	T	F	F	F	P1101
92	F	T	F	T	T	F	F	T	P1101
93	F	T	F	T	T	F	T	F	P1101
94	F	T	F	T	T	F	T	T	P1101
95	F	T	F	T	T	T	F	F	P1101
96	F	T	F	T	T	T	F	T	P1101
97	F	T	F	T	T	T	T	F	P1101
98	F	T	F	T	T	T	T	T	P1101
99	F	T	T	F	F	F	F	F	P1101
100	F	T	T	F	F	F	F	T	P1101
101	F	T	T	F	F	F	T	F	P1101
102	F	T	T	F	F	F	T	T	P1101
103	F	T	T	F	F	T	F	F	P1101
104	F	T	T	F	F	T	F	T	P1101
105	F	T	T	F	F	T	T	F	P1101
106	F	T	T	F	F	T	T	T	P1101
107	F	T	T	F	T	F	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

108	F	T	T	F	T	F	F	T	P1101
109	F	T	T	F	T	F	T	F	P1101
110	F	T	T	F	T	F	T	T	P1101
111	F	T	T	F	T	T	F	F	P1101
112	F	T	T	F	T	T	F	T	P1101
113	F	T	T	F	T	T	T	F	P1101
114	F	T	T	F	T	T	T	T	P1101
115	F	T	T	T	F	F	F	F	P0106
116	F	T	T	T	F	F	F	T	P0106
117	F	T	T	T	F	F	T	F	P0106
118	F	T	T	T	F	F	T	T	P0106
119	F	T	T	T	F	T	F	F	P1101
120	F	T	T	T	F	T	F	T	P1101
121	F	T	T	T	F	T	T	F	P1101
122	F	T	T	T	F	T	T	T	P1101
123	F	T	T	T	T	F	F	F	P1101
124	F	T	T	T	T	F	F	T	P1101
125	F	T	T	T	T	F	T	F	P1101
126	F	T	T	T	T	F	T	T	P1101
127	F	T	T	T	T	T	F	F	P1101
128	F	T	T	T	T	T	F	T	P1101
129	F	T	T	T	T	T	T	F	P1101
130	F	T	T	T	T	T	T	T	P1101
131	T	F	F	F	F	F	F	F	No DTC
132	T	F	F	F	F	F	F	T	P1101
133	T	F	F	F	F	F	T	F	P1101
134	T	F	F	F	F	F	T	T	P0236
135	T	F	F	F	F	T	F	F	P1101
136	T	F	F	F	F	T	F	T	P0121
137	T	F	F	F	F	T	T	F	P1101
138	T	F	F	F	F	T	T	T	P0236
139	T	F	F	F	T	F	F	F	P1101
140	T	F	F	F	T	F	F	T	P1101
141	T	F	F	F	T	F	T	F	P1101
142	T	F	F	F	T	F	T	T	P0236
143	T	F	F	F	T	T	F	F	P1101
144	T	F	F	F	T	T	F	T	P0121
145	T	F	F	F	T	T	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

146	T	F	F	F	T	T	T	T	P0236
147	T	F	F	T	F	F	F	F	P1101
148	T	F	F	T	F	F	F	T	P1101
149	T	F	F	T	F	F	T	F	P1101
150	T	F	F	T	F	F	T	T	P1101
151	T	F	F	T	F	T	F	F	P1101
152	T	F	F	T	F	T	F	T	P1101
153	T	F	F	T	F	T	T	F	P1101
154	T	F	F	T	F	T	T	T	P1101
155	T	F	F	T	T	F	F	F	P1101
156	T	F	F	T	T	F	F	T	P1101
157	T	F	F	T	T	F	T	F	P1101
158	T	F	F	T	T	F	T	T	P1101
159	T	F	F	T	T	T	F	F	P1101
160	T	F	F	T	T	T	F	T	P1101
161	T	F	F	T	T	T	T	F	P1101
162	T	F	F	T	T	T	T	T	P1101
163	T	F	T	F	F	F	F	F	P1101
164	T	F	T	F	F	F	F	T	P1101
165	T	F	T	F	F	F	T	F	P1101
166	T	F	T	F	F	F	T	T	P1101
167	T	F	T	F	F	T	F	F	P1101
168	T	F	T	F	F	T	F	T	P1101
169	T	F	T	F	F	T	T	F	P1101
170	T	F	T	F	F	T	T	T	P1101
171	T	F	T	F	T	F	F	F	P1101
172	T	F	T	F	T	F	F	T	P1101
173	T	F	T	F	T	F	T	F	P1101
174	T	F	T	F	T	F	T	T	P1101
175	T	F	T	F	T	T	F	F	P1101
176	T	F	T	F	T	T	F	T	P1101
177	T	F	T	F	T	T	T	F	P1101
178	T	F	T	F	T	T	T	T	P1101
179	T	F	T	T	F	F	F	F	P1101
180	T	F	T	T	F	F	F	T	P1101
181	T	F	T	T	F	F	T	F	P1101
182	T	F	T	T	F	F	T	T	P1101
183	T	F	T	T	F	T	F	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

184	T	F	T	T	F	T	F	T	P1101
185	T	F	T	T	F	T	T	F	P1101
186	T	F	T	T	F	T	T	T	P1101
187	T	F	T	T	T	F	F	F	P0101 or P010B
188	T	F	T	T	T	F	F	T	P0101 or P010B
189	T	F	T	T	T	F	T	F	P0101 or P010B
190	T	F	T	T	T	F	T	T	P0101 or P010B
191	T	F	T	T	T	T	F	F	P1101
192	T	F	T	T	T	T	F	T	P1101
193	T	F	T	T	T	T	T	F	P1101
194	T	F	T	T	T	T	T	T	P1101
195	T	T	F	F	F	F	F	F	P1101
196	T	T	F	F	F	F	F	T	P1101
197	T	T	F	F	F	F	T	F	P1101
198	T	T	F	F	F	F	T	T	P0236
199	T	T	F	F	F	T	F	F	P1101
200	T	T	F	F	F	T	F	T	P0121
201	T	T	F	F	F	T	T	F	P1101
202	T	T	F	F	F	T	T	T	P0236
203	T	T	F	F	T	F	F	F	P1101
204	T	T	F	F	T	F	F	T	P1101
205	T	T	F	F	T	F	T	F	P1101
206	T	T	F	F	T	F	T	T	P0236
207	T	T	F	F	T	T	F	F	P1101
208	T	T	F	F	T	T	F	T	P0121
209	T	T	F	F	T	T	T	F	P1101
210	T	T	F	F	T	T	T	T	P0236
211	T	T	F	T	F	F	F	F	P1101
212	T	T	F	T	F	F	F	T	P1101
213	T	T	F	T	F	F	T	F	P1101
214	T	T	F	T	F	F	T	T	P1101
215	T	T	F	T	F	T	F	F	P1101
216	T	T	F	T	F	T	F	T	P1101
217	T	T	F	T	F	T	T	F	P1101
218	T	T	F	T	F	T	T	T	P1101
219	T	T	F	T	T	F	F	F	P1101
220	T	T	F	T	T	F	F	T	P1101
221	T	T	F	T	T	F	T	F	P1101

Initial Supporting table - P0101, P0106, P010B, P0121, P0236, P1101: Turbocharger Intake Flow Rationality Diagnostic Failure Matrix

222	T	T	F	T	T	F	T	T	P1101
223	T	T	F	T	T	T	F	F	P1101
224	T	T	F	T	T	T	F	T	P1101
225	T	T	F	T	T	T	T	F	P1101
226	T	T	F	T	T	T	T	T	P1101
227	T	T	T	F	F	F	F	F	P1101
228	T	T	T	F	F	F	F	T	P1101
229	T	T	T	F	F	F	T	F	P1101
230	T	T	T	F	F	F	T	T	P1101
231	T	T	T	F	F	T	F	F	P1101
232	T	T	T	F	F	T	F	T	P1101
233	T	T	T	F	F	T	T	F	P1101
234	T	T	T	F	F	T	T	T	P1101
235	T	T	T	F	T	F	F	F	P1101
236	T	T	T	F	T	F	F	T	P1101
237	T	T	T	F	T	F	T	F	P1101
238	T	T	T	F	T	F	T	T	P1101
239	T	T	T	F	T	T	F	F	P1101
240	T	T	T	F	T	T	F	T	P1101
241	T	T	T	F	T	T	T	F	P1101
242	T	T	T	F	T	T	T	T	P1101
243	T	T	T	T	F	F	F	F	P1101
244	T	T	T	T	F	F	F	T	P1101
245	T	T	T	T	F	F	T	F	P1101
246	T	T	T	T	F	F	T	T	P1101
247	T	T	T	T	F	T	F	F	P1101
248	T	T	T	T	F	T	F	T	P1101
249	T	T	T	T	F	T	T	F	P1101
250	T	T	T	T	F	T	T	T	P1101
251	T	T	T	T	T	F	F	F	P1101
252	T	T	T	T	T	F	F	T	P1101
253	T	T	T	T	T	F	T	F	P1101
254	T	T	T	T	T	F	T	T	P1101
255	T	T	T	T	T	T	F	F	P1101
256	T	T	T	T	T	T	F	T	P1101
257	T	T	T	T	T	T	T	F	P1101
258	T	T	T	T	T	T	T	T	P1101

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP1 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP2 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP2 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	0.850	0.990	0.979	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P012B, P0236, P1101: MAP3 Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P012B_P0236_P1101 MAP3 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	0.943	0.850	0.990	0.970	1.000	1.000	1.000	1.000	1.000	1.000	0.800	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	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP Residual Weight Factor based on RPM

Description: P0101_P0106_P0121_P0236_P1101 TIAP Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	0.873	1.000	0.799	0.695	0.700	0.514	0.553	0.613	0.913	0.896	0.841	0.762	0.815	0.630	1.000

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max Air Flow

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Max Air Flow

Value Units: Engine Air Flow (Grams/Second)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	13.0	13.0	13.0	16.0	20.0	24.0	28.0	31.0	32.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Max MAP

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Max MAP

Value Units: Manifold Pressure (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-Baro Correlation Offset

Description: P0101_P0106_P0121_P0236_P1101 TIAP-Baro Correlation Offset

Value Units: Pressure Difference (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	0.0	1.5	3.5	6.0	9.0	12.0	16.0	20.0	25.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min Air Flow

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Min Air Flow

Value Units: Engine Air Flow (Grams/Second)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	17.0	43.0	92.0	120.0	164.0	189.0	205.0	195.0	190.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Min MAP

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Min MAP

Value Units: Manifold Pressure (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	105.0	130.0	150.0	152.0	175.0	190.0	190.0	165.0	160.0

Initial Supporting table - P0101, P0106, P0121, P0236, P1101: TIAP-MAP Correlation Offset

Description: P0101_P0106_P0121_P0236_P1101 TIAP-MAP Correlation Offset

Value Units: Pressure Difference (kPa)
X Unit: Engine Speed (RPM)

y/x	1,000	1,750	2,500	3,250	4,000	4,750	5,500	6,250	7,000
1	5.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0

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	22	22	22	22	22
0.125	22	22	22	22	22
0.250	22	22	22	22	22
0.375	22	22	22	22	22
0.500	22	22	22	22	22
0.625	22	22	22	22	22
0.750	22	22	22	22	22
0.875	22	22	22	22	22
1.000	22	22	22	22	22

Initial Supporting table - P1400_ColdStartDiagnosticDelayBasedOnEngineRunTime

Description: Quality weight-based on engine run time. This allows adjustment of the weighting factors at various engine run times in order to prevent the updating of the cumulative quality timer or to change the value of the average qualified residual energy calculation to prevent false Fails of the diagnostic under circumstances inappropriate to update the calculation of the average qualified residual value.

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

Initial Supporting table - P1400_ColdStartDiagnosticDelayBasedOnEngineRunTimeCalAxis

Description: This is the x-axis for the KtCSED_K_TimeWght calibration table. Refer to the description for KtCSED_K_TimeWght for details.

y/x	1	2	3	4	5	6	7	8	9
1	0	1	2	3	4	5	10	15	20

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	800	850	900	950	1,000	1,020	1,050	1,100	1,150	1,200	1,250	1,300	1,350	1,400	1,450	1,500
1	0	2	3	11	11	11	15	15	15	15	15	20	25	30	30	30	30

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	-19	-15	-10	-2	4	6	8	10	12
1	1.25	1.25	1.13	0.81	0.81	0.69	0.63	0.63	0.63

Initial Supporting table - P2B96 - Opening Magnitude Misisng Pulse Fail Limit

Description: Opening Magnitude threshold to detect missing injection pulse

Value Units: Opening Magnitude Voltage
X Unit: Measured Fuel Rail Pressure

y/x	0	2	4	5	6	8	9	10	11	12	14	16	18	19	20	21	24
1	0	0	231	193	203	199	195	152	227	194	190	213	190	206	187	175	182

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on MAF Est

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on MAF Est

Value Units: Weight Factor (Unitless)
X Unit: Estimated Engine Air Flow (Grams/Second)

y/x	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	230	250
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Initial Supporting table - P0101, P0106, P010B, P0121, P012B, P0236, P1101: MAF1 Residual Weight Factor based on RPM

Description: P0101_P0106_P010B_P0121_P012B_P0236_P1101 MAF1 Residual Weight Factor based on RPM

Value Units: Weight Factor (Unitless)
X Unit: Engine Speed (RPM)

y/x	0	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000	6,200
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.970	1.000	0.998	1.000	1.000	0.839	0.703	1.000	1.000

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	200.000	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_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	200.000	500.000	500.000	1,000.000	2,000.000	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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	3	3	3	3	3	3	3	3

P0606_PSW Sequence Fail f(Loop Time) - Part 2

y/x	CePISR_e_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	3	3	3	3	3	3	3	3

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	4	4	4	4	4	4	4	4

P0606_PSW Sequence Sample f(Loop Time) - Part 2

y/x	CePISR_e_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	4	4	4	4	4	4	4	4

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	36.71	36.71	36.71	36.71	36.71	36.71

Initial Supporting table - P16F3_Speed Control External Load f(Oil Temp, RPM)

Description: Specifies the external load table for SPDR torque security as a function of engine oil temperature and engine RPM.

y/x	-40.00	-20.00	-10.00	0.00	50.00	90.00
350.00	132.62	116.39	128.21	137.13	89.22	37.63
450.00	132.62	116.39	128.21	137.13	89.22	37.63
550.00	132.62	116.39	128.21	137.13	89.22	37.63
650.00	131.12	114.89	126.28	134.38	86.75	35.33
700.00	131.62	115.39	126.71	135.13	87.47	31.92
800.00	139.98	122.39	132.07	138.87	89.72	23.65
900.00	152.14	133.04	141.96	148.03	96.40	23.31
1,000.00	161.68	141.70	150.84	147.35	101.12	20.63
1,100.00	168.75	147.91	150.30	144.88	95.41	23.33
1,200.00	182.73	160.56	153.34	149.63	88.80	24.51
1,300.00	196.71	173.21	159.47	154.37	84.54	25.69
1,400.00	206.27	185.88	175.87	174.88	94.62	41.27
2,000.00	98.86	81.29	57.55	40.28	-21.77	-26.42
2,500.00	-98.63	-98.63	-98.63	-98.63	-98.63	-98.63
3,000.00	-108.49	-108.49	-108.49	-108.49	-108.49	-108.49
4,000.00	-118.36	-118.36	-118.36	-118.36	-118.36	-118.36
6,000.00	-128.22	-128.22	-128.22	-128.22	-128.22	-128.22

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	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
2	0.52	1.44	2.64	2.55	2.75	1.72	1.27	0.84	0.86	1.24	0.74	1.10	1.00	0.85	0.83	0.73	0.70
8	0.52	1.24	0.70	0.90	1.01	1.02	1.19	1.40	1.45	2.00	1.12	1.11	1.00	0.85	1.00	1.00	0.71
12	0.31	1.04	0.99	1.50	0.90	0.87	0.90	1.43	1.42	1.94	1.08	1.05	0.94	0.85	0.91	1.00	0.38
16	0.70	0.65	0.64	0.90	0.85	0.49	0.97	1.06	1.07	1.44	0.88	0.91	0.84	0.73	0.71	0.80	0.20
20	-0.10	0.11	0.33	0.90	1.00	0.96	0.96	0.77	0.82	1.15	0.72	0.75	0.76	0.65	0.56	0.62	0.00
24	-0.24	-0.18	0.06	0.80	0.40	0.73	0.75	0.60	0.65	0.94	0.60	0.60	0.70	0.53	0.37	0.38	-0.07
30	-0.40	-0.41	-0.18	0.13	0.48	0.30	0.14	0.40	0.47	0.73	0.39	0.40	0.48	0.20	0.17	0.15	-0.21
40	-0.58	-0.60	-0.39	0.10	0.13	-0.12	0.10	0.17	0.23	0.33	0.14	0.15	0.26	-0.06	-0.03	-0.11	-0.31
60	-0.80	-0.75	-0.57	-0.36	-0.24	-0.48	-0.23	-0.04	0.03	0.06	-0.02	-0.07	-0.05	-0.29	-0.29	-0.34	-0.39

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	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
2	-0.77	-0.91	-1.27	-1.44	-1.17	-0.79	-0.61	-0.73	-0.67	-0.62	-0.24	-0.25	0.40	0.31	-0.27	-0.21	-0.15
8	-0.87	-0.97	-0.60	-0.86	-1.13	-0.66	-0.67	-1.10	-0.79	-0.74	-0.44	-0.56	-0.30	-0.29	-0.86	-0.62	-0.25
12	-0.86	-0.97	-0.75	-0.76	-1.38	-0.82	-1.03	-0.83	-0.82	-0.55	-0.69	-0.73	-0.67	-0.58	-1.20	-0.80	-0.43
16	-0.90	-0.98	-0.86	-0.69	-1.49	-0.89	-0.99	-0.79	-0.85	-0.54	-0.65	-0.76	-0.75	-0.72	-1.26	-0.79	-0.53
20	-0.93	-0.99	-0.89	-0.62	-1.35	-0.82	-1.15	-0.96	-0.88	-0.81	-0.80	-0.75	-0.70	-0.59	-1.20	-0.83	-0.60
24	-0.96	-0.99	-0.90	-0.72	-1.20	-0.92	-0.53	-1.06	-0.93	-0.88	-0.83	-0.80	-0.72	-0.69	-1.19	-0.85	-0.70
30	-0.98	-0.99	-0.91	-0.73	-0.95	-1.00	-1.27	-1.17	-1.04	-0.94	-0.67	-0.84	-0.77	-0.69	-1.18	-0.82	-0.74
40	-1.01	-1.00	-0.93	-0.77	-1.13	-1.07	-0.76	-1.27	-0.87	-0.90	-0.73	-0.88	-0.69	-0.92	-1.13	-0.82	-0.80
60	-1.04	-1.00	-0.94	-0.84	-1.10	-1.22	-1.36	-1.36	-0.85	-0.81	-0.79	-0.89	-0.78	-0.82	-1.12	-0.85	-0.86

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
2	-1	-1	-1	-1	-1	-1	-1	-1	-1
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

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
2	5	15	15	15	15	15	15	15	15
8	5	15	15	15	15	15	15	15	15
12	4	15	15	15	15	15	15	15	15
16	3	11	15	15	15	15	15	15	15
20	3	15	15	15	15	15	15	15	15
24	2	15	15	15	15	15	15	15	15
30	2	13	15	15	15	15	15	15	15
40	2	9	15	15	15	15	15	15	15
60	2	4	7	15	15	15	15	15	15

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	3	3	3	3	3	3	3	3

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
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 - 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
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 - 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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	5.50	6.00	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	5.00	5.50	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	4.50	5.00	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
16	4.00	4.50	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	3.50	4.00	6.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	3.00	3.50	5.00	7.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
30	2.50	3.00	4.00	6.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
40	2.00	2.50	3.50	4.50	8.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	1.50	2.00	3.50	5.00	9.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00

Initial Supporting table - 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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	5.50	6.00	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	5.00	5.50	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	4.50	5.00	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
16	4.00	4.50	7.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	3.50	4.00	6.00	8.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	3.00	3.50	5.00	7.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
30	2.50	3.00	4.00	6.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
40	2.00	2.50	3.50	4.50	8.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	1.50	2.00	3.50	5.00	9.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00

Initial Supporting table - 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	22.5	22.5	12.5	12.5	12.5	12.5	12.5	12.5
10	22.5	22.5	12.5	12.5	12.5	8.3	12.5	12.5
20	22.5	22.5	12.5	12.5	8.3	8.3	6.3	6.3
30	12.5	12.5	12.5	12.5	6.3	4.6	4.6	4.6
40	12.5	12.5	8.3	6.3	5.0	4.6	4.6	4.6
50	8.3	8.3	8.3	6.3	4.6	4.6	4.6	4.6
60	6.3	6.3	6.3	4.6	4.6	4.6	4.6	4.6
70	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
80	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
90	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
100	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6

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
2	5.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	4.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	3.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
16	3.00	11.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	2.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	2.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
30	1.88	13.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
40	1.76	9.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	4.00	6.50	15.00	15.00	15.00	15.00	15.00	15.00

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
2	3.75	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	3.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	2.00	15.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00
16	1.50	8.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	1.50	7.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	1.50	6.25	11.00	15.00	15.00	15.00	15.00	15.00	15.00
30	1.50	4.25	8.00	15.00	15.00	15.00	15.00	15.00	15.00
40	1.50	3.00	4.50	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	2.00	3.00	8.00	15.00	15.00	15.00	15.00	15.00

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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	1.05	0.80	2.00	2.20	2.40	1.50	1.62	1.49	1.29	1.33	1.39	1.49	1.50	1.50	1.62	1.33	1.27
8	0.87	0.80	1.30	1.50	1.50	1.07	1.02	1.77	1.32	1.16	1.61	1.85	1.47	1.44	1.62	1.60	1.75
12	0.91	0.70	1.10	1.13	1.04	0.84	1.05	1.12	1.08	0.87	1.44	1.65	1.60	1.35	1.62	1.48	1.70
16	0.91	0.75	1.00	1.15	0.66	0.66	1.09	0.87	1.02	0.86	1.40	1.44	1.65	1.21	1.33	1.14	1.32
20	0.92	0.75	1.00	1.00	0.59	0.54	1.10	0.91	0.97	0.92	1.44	1.46	1.54	1.14	1.18	1.00	1.08
24	0.92	0.87	1.00	1.19	0.70	0.48	1.02	0.95	0.94	0.96	1.44	1.43	1.37	1.04	1.05	0.84	0.88
30	0.92	0.90	0.95	1.13	0.95	0.40	0.82	0.95	0.96	0.93	1.42	1.34	1.24	1.04	0.90	0.83	0.70
40	0.93	0.94	0.95	1.01	0.85	0.59	0.83	0.96	0.94	0.91	1.17	1.02	1.05	1.05	0.94	0.91	0.81
60	0.93	0.99	1.01	1.10	0.95	0.75	0.72	0.95	0.92	0.88	0.85	0.75	0.67	0.86	0.94	0.96	0.98

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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	0	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1
8	0	0	0	0	-1	-1	-2	0	0	0	0	0	0	0	0	1	1
12	0	0	0	0	-1	-2	-2	-1	-1	-1	0	0	0	0	0	1	1
16	0	0	0	0	-1	-2	-2	-1	0	0	0	0	0	0	0	0	0
20	0	0	0	0	-1	-2	-2	-1	0	0	0	0	0	0	0	0	0
24	0	0	0	0	-1	-2	-2	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	-1	-2	-2	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	-1	-1	-1	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	-1	0	0	0	0	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
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
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
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
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
2	4	15	15	15	15	15	15	15	15
8	3	15	15	15	15	15	15	15	15
12	2	15	10	15	15	15	15	15	15
16	2	8	15	15	15	15	15	15	15
20	2	8	15	15	15	15	15	15	15
24	2	6	11	15	15	15	15	15	15
30	2	4	8	15	15	15	15	15	15
40	2	3	5	15	15	15	15	15	15
60	2	2	3	8	15	15	15	15	15

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
2	5.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	4.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	3.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
16	3.00	11.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	2.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	2.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
30	1.88	13.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
40	1.76	9.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	4.00	6.50	15.00	15.00	15.00	15.00	15.00	15.00

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	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	3,300	3,136	3,165	1,729	852	573	344	439	287	219	144	131	101
6	3,512	3,271	3,032	1,641	923	691	531	439	299	190	136	129	92
8	3,860	3,473	3,082	1,656	959	727	571	464	359	212	168	126	95
10	4,209	3,778	3,247	1,744	1,008	764	624	568	430	243	196	126	101
12	4,557	4,100	3,544	1,860	1,066	868	653	651	500	276	228	137	110
14	4,905	4,423	3,844	2,039	1,137	1,009	701	696	573	318	261	157	122
16	5,254	4,745	4,143	2,333	1,229	1,251	837	793	647	362	297	180	134
18	5,602	5,067	4,443	2,654	1,390	1,484	1,010	901	723	406	331	203	145
20	5,951	5,389	4,743	2,975	1,657	1,716	1,182	1,026	803	446	363	231	162
22	6,299	5,712	5,042	3,296	1,964	1,949	1,355	1,151	887	475	389	252	184
24	6,647	6,034	5,342	3,617	2,271	2,182	1,527	1,275	970	525	416	276	208
26	6,996	6,356	5,642	3,938	2,578	2,414	1,700	1,400	1,060	575	445	299	231
30	7,693	7,001	6,241	4,579	3,192	2,880	2,045	1,649	1,221	652	507	357	276
40	9,435	8,612	7,739	6,184	4,726	4,043	2,908	2,273	1,719	1,018	733	495	378
60	12,919	11,835	10,735	9,393	7,796	6,370	4,633	3,519	2,721	1,716	1,208	843	622
78	15,967	14,654	13,357	12,201	10,482	8,405	6,142	4,610	3,500	2,327	1,623	1,169	848
97	19,451	17,877	16,353	15,410	13,551	10,732	7,867	5,857	4,397	3,026	2,098	1,617	1,169

CylModeDecel - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	84	75	56	52	41	25	20	10	8	7	6	6	5
6	62	53	45	41	33	20	16	10	8	7	6	5	4
8	57	48	39	31	26	16	13	10	8	7	5	4	4
10	63	54	37	28	23	15	12	10	9	7	5	4	4
12	67	60	43	31	26	16	13	10	9	7	6	4	4
14	77	68	50	37	29	19	15	11	9	7	6	5	5
16	90	75	58	41	35	22	16	12	10	8	7	5	5
18	107	82	67	49	40	24	18	13	10	8	8	6	6
20	124	93	75	57	45	27	20	14	11	9	8	7	7
22	142	105	83	65	50	30	22	16	11	9	9	7	7
24	159	117	92	72	57	33	24	18	12	10	10	8	8

Initial Supporting table - CylModeDecel

26	177	129	100	80	64	37	26	19	12	11	10	9	9
30	212	153	119	96	78	43	31	23	14	13	12	10	10
40	300	212	171	134	113	71	54	33	20	18	16	14	13
60	475	331	266	212	183	133	98	59	37	30	24	21	19
78	629	435	359	280	245	186	136	84	53	40	32	27	25
97	813	554	456	367	315	259	180	119	73	53	41	34	31

Initial Supporting table - CylModeJerk

Description: Crankshaft jerk threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
Y Units: percent load of max indicated torque (%)

CylModeJerk - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	6,130	4,012	2,764	1,676	967	573	393	295	241	203	141	116	109
6	6,177	4,071	2,764	1,943	1,119	783	683	519	359	216	149	138	106
8	6,515	4,269	2,989	2,170	1,424	963	810	626	454	253	180	144	113
10	6,857	4,641	3,383	2,555	1,790	1,156	936	769	571	305	201	154	119
12	7,199	5,013	3,777	2,940	2,156	1,396	1,103	908	681	357	220	168	134
14	7,542	5,385	4,172	3,324	2,521	1,719	1,252	1,041	761	400	255	184	146
16	7,884	5,757	4,566	3,709	2,887	2,043	1,487	1,142	862	456	284	209	163
18	8,226	6,129	4,961	4,093	3,252	2,366	1,722	1,292	963	504	331	204	163
20	8,568	6,501	5,355	4,478	3,618	2,689	1,957	1,435	1,065	572	377	239	188
22	8,911	6,873	5,749	4,862	3,984	3,012	2,192	1,590	1,166	641	423	273	214
24	9,253	7,245	6,144	5,247	4,349	3,335	2,428	1,740	1,267	709	469	308	240
26	9,595	7,617	6,538	5,631	4,715	3,658	2,663	1,889	1,368	778	515	342	265
30	10,280	8,361	7,327	6,401	5,446	4,305	3,133	2,187	1,571	896	608	411	317
40	11,991	10,222	9,299	8,323	7,274	5,920	4,309	2,934	2,077	1,257	838	583	445
60	15,414	13,943	13,243	12,169	10,931	9,152	6,662	4,426	3,090	1,941	1,300	928	702
78	18,409	17,198	16,694	15,534	14,130	11,979	8,720	5,732	3,975	2,540	1,704	1,229	926
97	21,832	20,919	20,638	19,380	17,786	15,210	11,072	7,225	4,988	3,224	2,163	1,574	1,183

CylModeJerk - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	88	81	62	53	47	24	21	14	10	8	8	7	7
6	82	62	47	37	40	22	18	13	10	7	7	7	6
8	84	62	43	38	39	21	16	13	10	7	7	7	6
10	88	69	49	45	40	24	17	13	11	8	7	7	6
12	96	79	59	55	44	28	20	15	12	10	8	8	7
14	108	90	69	66	50	35	24	17	13	11	8	9	8
16	125	101	75	76	59	42	29	21	14	13	10	10	9
18	141	114	87	87	68	48	33	24	16	15	11	11	9
20	157	127	99	97	77	55	38	27	19	16	13	12	10
22	173	141	111	108	86	61	42	30	21	18	14	13	11
24	189	154	123	119	95	68	47	33	24	20	16	14	12

Initial Supporting table - CylModeJerk

26	206	167	135	129	104	74	51	36	26	21	17	15	12
30	238	194	159	150	122	87	60	43	31	24	20	17	14
40	317	261	219	203	166	120	82	58	43	33	27	23	18
60	482	395	339	309	255	186	127	90	67	49	41	33	25
78	626	512	444	401	333	243	165	117	88	64	54	43	32
97	791	646	565	507	422	308	210	148	112	80	68	53	40

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
2	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
24	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
60	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
2	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
24	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
60	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	6,000	6,000	6,000	6,000	6,000	5,900	6,000

EngineOverSpeedLimit - Part 2

y/x	CeTGRR_e_TransGr10	CeTGRR_e_TransGrNeut	CeTGRR_e_TransGrRvrs	CeTGRR_e_TransGrPark	CeTGRR_e_TransGr7	CeTGRR_e_TransGr8	
1	6,000	4,000	6,000	4,000	6,000	6,000	

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	3	3	3	3	3	3	3	3	3

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	-30	-24	-16	-8	0	8	16	20	24	32	40	48	64	80	96	112
1	5.0	5.0	5.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

upporting table - P00C6 - maximum acceptable counts of fuel rail pressure below KtFHPD_p_HPS_PressFallLoThrsh after High Pressure Sta

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	-30	-24	-16	-8	0	8	16	20	24	32	40	48	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	-30	-24	-16	-8	0	8	16	20	24	32	40	48	64	80	96	112
0	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
13	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
25	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
38	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
50	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
63	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
75	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
88	2.0	2.0	2.0	2.0	2.0	1.0	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
100	2.0	2.0	2.0	2.0	2.0	1.0	0.7	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	-30	-24	-16	-8	0	8	16	20	24	32	40	48	64	80	96	112
0	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
13	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
38	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
50	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
63	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
75	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
88	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
100	15.0	15.0	12.5	10.0	8.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Initial Supporting table - 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	1.50	3.00	7.00	15.00	20.00	25.00	27.50	32.00	36.00
1.00	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.09	1.05

Initial Supporting table - P0191 - Low fail limit of fuel control due to pressure sensor skewed low

Description: Low fail limit of fuel control due to pressure sensor skewed low error as Function of desired pressure

Value Units: Ratio
X Unit: Desired Pressure (Mpa)

y/x	1.50	3.00	7.00	15.00	20.00	25.00	27.50	32.00	36.00
1.00	0.76	0.81	0.81	0.81	0.81	0.82	0.86	0.92	0.95

Initial Supporting table - P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Closing Time

Description: Maximum injector closing time function of measured fuel rail pressure

Value Units: Injector Closing Time (us)
X Unit: Measrured Fuel Rail Pressure (MPa)

y/x	0.40	2.00	4.00	5.00	6.00	8.00	9.00	10.00	11.00	12.00	14.00	16.00	18.00	19.00	20.00	21.00	24.00
1.00	385	336	281	263	246	217	202	190	180	170	151	135	120	112	105	98	79

Initial Supporting table - P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Maximum Injector Opening Magnitude

Description: Maximum injector opening Magnitude voltage function of measured fuel rail pressure

Value Units: Opening Magnitude Voltage
X Unit: Measrured Fuel Rail Pressure (MPa)

y/x	0.40	2.00	4.00	5.00	6.00	8.00	9.00	10.00	11.00	12.00	14.00	16.00	18.00	19.00	20.00	21.00	24.00
1.00	989	989	982	997	996	1,000	1,005	1,000	987	991	990	986	989	989	984	976	952

Initial Supporting table - P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Closing Time

Description: Minimum injector closing time function of measured fuel rail pressure

Value Units: Injector Closing Time (us)
X Unit: Measrured Fuel Rail Pressure (MPa)

y/x	0.40	2.00	4.00	5.00	6.00	8.00	9.00	10.00	11.00	12.00	14.00	16.00	18.00	19.00	20.00	21.00	24.00
1.00	385	336	281	263	246	217	202	190	180	170	151	135	120	112	105	98	79

Initial Supporting table - P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Minimum Injector Opening Magnitude

Description: Minimum injector opening Magnitude voltage function of measured fuel rail pressure

Value Units: Opening Magnitude Voltage
X Unit: Measrured Fuel Rail Pressure (MPa)

y/x	0.40	2.00	4.00	5.00	6.00	8.00	9.00	10.00	11.00	12.00	14.00	16.00	18.00	19.00	20.00	21.00	24.00
1.00	389	389	382	397	396	400	405	400	387	391	390	386	389	389	384	376	352

al Supporting table - P02EE P02EF P02F0 P02F1 P02F2 P02F3 P02F4 P02F5 P30D4 - Voltage Feedback Rationalities Minimum Pulse Width

Description: Minimum injection pulse width function of measured fuel rail pressure where the voltage feedback measured from the analog to digital converter is rationalized

Value Units: Pulse Width (ms)
X Unit: Measrured Fuel Rail Pressure (MPa)

y/x	0.40	2.00	4.00	5.00	6.00	8.00	9.00	10.00	11.00	12.00	14.00	16.00	18.00	19.00	20.00	21.00	24.00
1.00	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Initial Supporting table - P0420_BestFailingOSCTableB1

Description: This table is a 9x17 table of baseline Best Failing (e.g. threshold converter) OSC times for catalyst Bank 1. The axis' for this table include the average airflow and the catalyst temperature. After OSC is measured for a specific temp and airflow,the BestFailing OSC value is found within this table for the measured temp and airflow and is used along with the OSC_TimeRaw (and the WorstPassing value) to calculate the Normalized Ratio for that specific test. The values in this table are based on the measured OSC for the identified BPU converter that is used for MIL illumination across the specific temp and airflow range for a given program.

y/x	2.48	2.87	3.27	3.66	4.06	4.46	4.85	5.25	5.64	6.04	6.44	6.83	7.23	7.62	8.02	8.42	8.81
628.00	1.75	1.68	1.56	1.43	1.33	1.24	1.14	1.08	1.01	0.95	0.90	0.84	0.79	0.73	0.68	0.65	0.62
662.00	1.80	1.73	1.60	1.48	1.35	1.26	1.17	1.11	1.04	0.98	0.93	0.86	0.80	0.74	0.69	0.66	0.63
696.00	1.85	1.77	1.64	1.52	1.39	1.28	1.19	1.13	1.06	1.00	0.95	0.88	0.82	0.76	0.70	0.67	0.64
730.00	1.90	1.81	1.67	1.55	1.43	1.31	1.21	1.16	1.08	1.03	0.97	0.91	0.84	0.78	0.72	0.68	0.66
765.00	1.94	1.85	1.70	1.58	1.45	1.32	1.24	1.18	1.10	1.04	0.99	0.92	0.86	0.80	0.73	0.69	0.67
799.00	1.97	1.87	1.72	1.60	1.47	1.35	1.27	1.19	1.12	1.05	1.00	0.93	0.87	0.81	0.74	0.70	0.67
833.00	1.99	1.90	1.74	1.61	1.49	1.37	1.29	1.21	1.13	1.06	1.00	0.94	0.88	0.81	0.75	0.71	0.68
867.00	2.01	1.91	1.76	1.63	1.50	1.39	1.30	1.21	1.14	1.07	1.01	0.94	0.89	0.82	0.76	0.72	0.69
901.00	2.02	1.93	1.77	1.64	1.51	1.40	1.31	1.22	1.14	1.08	1.02	0.95	0.90	0.82	0.77	0.73	0.70

Initial Supporting table - P0420_WorstPassingOSCTableB1

Description: This table is a 9x17 table of WorstPassing (e.g. 120k) OSC times for catalyst Bank 1. The axis' for this table include the average airflow and the catalyst temperature. After OSC is measured for a specific temp and airflow, the WorstPassing OSC value is found within this table for the measured temp and airflow and is used along with the OSC_TimeRaw (and the BestFailing OSC value) to calculate the Normalized Ratio for that specific test.The values in this table are based on the measured OSC for the WPA part across the temp and airflow range.

y/x	2.48	2.87	3.27	3.66	4.06	4.46	4.85	5.25	5.64	6.04	6.44	6.83	7.23	7.62	8.02	8.42	8.81
628.00	2.80	2.66	2.45	2.13	2.00	1.88	1.69	1.57	1.47	1.35	1.28	1.26	1.23	1.15	1.11	0.98	0.95
662.00	2.83	2.68	2.47	2.14	2.02	1.89	1.71	1.58	1.48	1.36	1.29	1.27	1.24	1.15	1.11	0.99	0.95
696.00	2.84	2.69	2.49	2.15	2.04	1.90	1.73	1.59	1.49	1.37	1.29	1.27	1.24	1.16	1.12	0.99	0.96
730.00	2.85	2.71	2.50	2.16	2.05	1.91	1.73	1.60	1.50	1.37	1.31	1.28	1.24	1.16	1.12	1.00	0.96
765.00	2.87	2.74	2.53	2.18	2.07	1.92	1.74	1.61	1.51	1.38	1.32	1.29	1.25	1.16	1.12	1.00	0.97
799.00	2.89	2.75	2.55	2.20	2.08	1.93	1.74	1.61	1.51	1.39	1.32	1.29	1.25	1.16	1.12	1.01	0.97
833.00	2.91	2.78	2.57	2.21	2.10	1.94	1.75	1.62	1.51	1.40	1.33	1.30	1.26	1.16	1.12	1.01	0.98
867.00	2.93	2.80	2.59	2.23	2.12	1.96	1.76	1.62	1.52	1.40	1.34	1.31	1.26	1.16	1.12	1.02	0.98
901.00	2.95	2.83	2.62	2.25	2.14	1.96	1.77	1.63	1.53	1.41	1.34	1.31	1.27	1.17	1.13	1.03	0.99

Initial Supporting table - P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit

Description: Minimum Small Pulse Compensation Fail Limit function of Pulse Width and Pressure

Value Units: Minimum Small Pulse Compensation Fail Limit (ms)
X Unit: Measrured Fuel Rail Pressure (MPa)
Y Units: Injection Pulse With (ms)

P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit - Part 1

y/x	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04
0.40	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14
2.00	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14
4.00	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07
5.00	-0.03	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07
6.00	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07
8.00	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07
9.00	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07
10.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07
11.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07
12.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07
14.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06
16.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06
18.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05
19.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05
20.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05
21.00	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
24.00	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05

P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit - Part 2

y/x	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.10
0.40	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14
2.00	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14
4.00	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.13
5.00	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.13
6.00	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.13
8.00	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.13
9.00	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.13
10.00	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11	-0.12	-0.12	-0.14
11.00	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.11	-0.12	-0.12	-0.14
12.00	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.12	-0.12	-0.14
14.00	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.12	-0.12	-0.14

Initial Supporting table - P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit

16.00	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.13	-0.14
18.00	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.14
19.00	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.14
20.00	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.14
21.00	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.18
24.00	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.19

P10A3 P10A5 P10A7 P10A9 P10AB P10AD P10AF P10B1 - Minimum Small Pulse Compensation Limit - Part 3

y/x	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	1.00	1.50
0.40	-0.19	-0.24	-0.29	-0.34	-0.39	-0.44	-0.49	-0.50	-0.50	-0.50	-0.50
2.00	-0.19	-0.24	-0.29	-0.34	-0.39	-0.44	-0.49	-0.50	-0.50	-0.50	-0.50
4.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
5.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
6.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
8.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
9.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
10.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
11.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
12.00	-0.18	-0.23	-0.28	-0.33	-0.38	-0.43	-0.48	-0.50	-0.50	-0.50	-0.50
14.00	-0.17	-0.22	-0.27	-0.32	-0.37	-0.42	-0.47	-0.50	-0.50	-0.50	-0.50
16.00	-0.17	-0.22	-0.27	-0.32	-0.37	-0.42	-0.47	-0.50	-0.50	-0.50	-0.50
18.00	-0.16	-0.21	-0.26	-0.31	-0.36	-0.41	-0.46	-0.50	-0.50	-0.50	-0.50
19.00	-0.16	-0.21	-0.26	-0.31	-0.36	-0.41	-0.46	-0.50	-0.50	-0.50	-0.50
20.00	-0.16	-0.21	-0.26	-0.31	-0.36	-0.41	-0.46	-0.50	-0.50	-0.50	-0.50
21.00	-0.19	-0.20	-0.25	-0.30	-0.35	-0.40	-0.45	-0.50	-0.50	-0.50	-0.50
24.00	-0.19	-0.19	-0.22	-0.27	-0.32	-0.37	-0.42	-0.47	-0.50	-0.50	-0.50

Initial Supporting table - P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit

Description: Maximum Small Pulse Compensation Fail Limit function of Pulse Width and Pressure

Value Units: Maximum Small Pulse Compensation Fail Limit (ms)
X Unit: Measrured Fuel Rail Pressure (MPa)
Y Units: Injection Pulse With (ms)

P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit - Part 1

y/x	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04
0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
2.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
4.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
6.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
8.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
10.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
11.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
12.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
16.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
19.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
20.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
24.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit - Part 2

y/x	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.10
0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
2.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
4.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
6.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
8.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
10.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
11.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
12.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Initial Supporting table - P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit

16.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
19.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
20.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
24.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

P10A4 P10A6 P10A8 P10AA P10AC P10AE P10B0 P10B2 - Maximum Small Pulse Compensation Limit - Part 3

y/x	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	1.00	1.50
0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
2.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
4.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
6.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
8.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
10.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
11.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
12.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
16.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
19.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
20.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
24.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Initial Supporting table - P228C P2C1F - 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	2	3	7	15	20	25	28	32	36
1	0	2	3	3	5	5	5	5	5

Initial Supporting table - P228D P2C20 - 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	1.50	3.00	7.00	15.00	20.00	25.00	27.50	32.00	36.00
1	-3.00	-3.00	-3.00	-3.00	-2.00	-2.00	-2.00	-2.00	-2.00

- P2B00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F - kaFULO_n_RP

Description: Max Engine Speed to allow Multipulse function of injector energy profile

Value Units: Max Engine Speed to allow Multipulse
X Unit: Injector Energy Profile
Y Units: Multipulse Mode (0 = Double Pulse, 1 = Triple Pulse)

y/x	0	1	2	3
0	3,600	3,000	2,300	3,600
1	3,000	0	0	3,000

00 P2B01 P2B02 P2B03 P2B04 P2B05 P2B06 P2B07 P2B96 P2B08 P2B09 P2B0A P2B0B P2B0C P2B0D P2B0E P2B0F- Opening Magnitude M

Description: Opening Magnitude threshold to detect missing injection pulse

Value Units: Opening Magnitude Voltage
X Unit: Measured Fuel Rail Pressure

y/x	0.40	2.00	4.00	5.00	6.00	8.00	9.00	10.00	11.00	12.00	14.00	16.00	18.00	19.00	20.00	21.00	24.00
1.00	0.00	0.00	230.81	192.81	202.81	198.50	195.31	152.38	226.50	194.31	190.31	213.31	190.13	205.69	187.00	174.63	182.19

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
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
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
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
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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	1.62	0.87	2.60	3.65	1.95	1.75	1.13	1.06	1.05	0.84	0.81	0.74	0.90	1.07	1.23	1.17	1.00
8	1.63	0.59	1.62	1.39	1.40	1.00	0.89	1.02	0.98	0.96	0.96	0.87	0.79	0.91	1.15	1.10	1.25
12	1.53	0.33	1.15	0.90	0.80	0.59	0.63	0.67	0.65	0.75	0.80	0.74	0.70	0.80	0.97	1.00	1.25
16	1.46	0.21	0.94	0.81	0.70	0.58	0.70	0.58	0.68	0.70	0.65	0.66	0.61	0.69	0.80	0.79	1.00
20	1.40	0.23	0.88	0.77	0.65	0.60	0.75	0.68	0.72	0.74	0.70	0.72	0.61	0.66	0.70	0.69	0.74
24	1.36	0.35	0.86	0.75	0.65	0.58	0.64	0.56	0.73	0.76	0.79	0.79	0.69	0.80	0.68	0.65	0.68
30	1.31	0.48	0.85	0.73	0.63	0.65	0.61	0.56	0.75	0.74	0.87	0.89	0.80	0.89	0.68	0.59	0.64
40	1.25	0.62	0.84	0.72	0.56	0.65	0.64	0.61	0.78	0.72	0.80	0.76	0.85	0.92	0.66	0.58	0.61
60	1.18	0.82	0.83	0.71	0.50	0.62	0.47	0.56	0.74	0.69	0.69	0.67	0.75	0.77	0.61	0.56	0.55

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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	1.16	1.73	3.22	3.93	4.39	2.37	1.91	1.39	1.51	1.34	1.81	1.88	1.69	1.85	1.84	1.07	1.05
8	1.23	1.19	1.75	1.33	1.95	1.39	1.25	1.29	1.48	1.16	1.45	1.78	1.53	1.30	1.71	0.86	1.07
12	1.20	0.71	0.96	0.77	1.09	1.04	1.05	0.95	0.77	0.90	0.89	1.09	1.05	0.98	1.14	0.80	0.85
16	1.18	0.38	0.61	0.61	0.98	1.00	1.10	0.96	0.85	0.73	0.61	0.68	0.75	0.89	0.84	0.84	0.80
20	1.17	0.44	0.65	0.67	0.99	1.02	1.20	0.98	0.94	0.75	0.56	0.75	0.68	0.76	0.68	0.84	0.81
24	1.15	0.55	0.67	0.71	0.99	1.03	1.10	0.99	0.94	0.81	0.70	0.81	0.70	0.79	0.67	0.83	0.82
30	1.14	0.64	0.70	0.74	0.99	1.04	1.08	1.00	0.97	0.86	0.80	0.87	0.79	0.77	0.75	0.84	0.80
40	1.11	0.74	0.72	0.78	0.99	1.07	1.04	1.01	1.00	0.92	0.88	0.92	0.96	0.93	0.88	0.85	0.77
60	1.08	0.84	0.75	0.81	0.99	1.09	1.00	1.02	1.03	0.99	0.98	0.97	1.10	1.15	1.05	0.87	0.79

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
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
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 - 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
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
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 - 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
2	5.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	4.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	3.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
16	3.00	11.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	2.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	2.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
30	1.88	13.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
40	1.76	9.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	4.00	6.50	15.00	15.00	15.00	15.00	15.00	15.00

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
2	3.75	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
8	3.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
12	2.00	15.00	10.00	15.00	15.00	15.00	15.00	15.00	15.00
16	1.50	8.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
20	1.50	7.50	15.00	15.00	15.00	15.00	15.00	15.00	15.00
24	1.50	6.25	11.00	15.00	15.00	15.00	15.00	15.00	15.00
30	1.50	4.25	8.00	15.00	15.00	15.00	15.00	15.00	15.00
40	1.50	3.00	4.50	15.00	15.00	15.00	15.00	15.00	15.00
60	1.50	2.00	3.00	8.00	15.00	15.00	15.00	15.00	15.00

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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	1.75	1.00	1.20	1.55	1.20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.35	1.50	1.50	1.00	1.00
8	1.90	1.00	1.57	1.50	1.45	1.13	1.15	1.39	1.24	1.29	1.05	1.00	1.15	1.15	1.35	1.45	1.65
12	1.74	1.00	2.00	2.10	1.45	1.30	1.59	1.62	2.03	1.90	1.35	1.35	1.38	1.35	1.45	1.65	1.65
16	1.61	1.00	2.23	2.15	1.50	1.33	1.66	1.77	1.75	1.53	1.35	1.35	1.38	1.35	1.45	1.65	1.65
20	1.52	1.00	1.98	1.90	1.47	1.36	1.70	1.76	1.75	1.53	1.35	1.35	1.38	1.35	1.45	1.65	1.65
24	1.44	1.01	1.72	1.76	1.45	1.43	1.60	1.58	1.75	1.53	1.35	1.35	1.38	1.35	1.45	1.65	1.65
30	1.35	1.01	1.50	1.62	1.42	1.46	1.50	1.60	1.72	1.53	1.35	1.35	1.38	1.35	1.45	1.65	1.65
40	1.24	1.02	1.32	1.50	1.32	1.33	1.45	1.52	1.62	1.53	1.25	1.35	1.32	1.35	1.45	1.65	1.65
60	1.05	1.02	1.10	1.38	1.21	1.15	1.15	1.45	1.58	1.40	1.05	1.07	1.05	1.35	1.45	1.65	1.65

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	400	600	800	1,000	1,200	1,600	2,000	2,400	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500
2	1.00	1.01	1.03	1.40	1.25	1.18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.00	1.00
8	1.00	1.07	1.06	1.25	1.12	1.10	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	1.00	1.04	1.01	1.35	1.11	1.34	1.22	1.09	1.05	1.26	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	1.00	1.03	1.00	1.40	1.10	1.45	1.34	1.19	1.09	1.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	1.00	1.01	1.00	1.32	1.00	1.42	1.46	1.23	1.10	1.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.25	1.00	1.36	1.36	1.26	1.13	1.15	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.20	1.00	1.34	1.27	1.27	1.13	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.15	1.00	1.31	1.22	1.28	1.14	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
60	1.00	1.00	1.00	1.10	1.05	1.29	1.10	1.28	1.10	1.05	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
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
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 - RepetSnapDecayAdjst

Description: Used for P0300 - P0308, If misfire is present in consecutive engine cycles, this multiplier is applied to the misfire jerk threshold and compared to a crankshaft snap value after the misfire has taken place.. Table lookup as a function of engine rpm.

Value Units: multiplier
X Unit: RPM

y/x	1,000	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000
1	4.50	4.50	4.75	6.50	6.50	6.20	5.50	5.50	5.50

Initial Supporting table - RevMode_Decel

Description: Used for P0300-P0308. Crankshaft decel threshold. Thresholds are a function of rpm and % engine Load.

Value Units: Delta time between revolutions (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	1,100	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
40	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
60	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
78	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
97	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - Ring Filter

Description: Used for P0300-P0308. Driveline Ring Filter
After a low level misfire, another misfire may not be detectable until driveline ringing ceases. If no ringing seen, stop filter early.

Value Units: Number of Engine cycles after isolated misfire (Engine cycles)
X Unit: thousands of RPM (rpm/1000)

y/x	0	1	2	3	4	5	6	7	8
1	4	4	4	4	4	4	4	4	4

Initial Supporting table - SCD_Decel

Description: Used for P0300-P0308 Crankshaft decel threshold. SCD mode uses smaller windows near TDC. Thresholds are a function of rpm and % engine Load.

Value Units: Delta time per cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
40	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
60	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
78	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
97	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - SCD_Jerk

Description: Used for P0300-P0308. Crankshaft jerk threshold. SCD mode uses smaller windows near TDC. Thresholds are a function of rpm and % engine Load.

Value Units: Change in Delta time per cylinder from last cylinder (usec)
X Unit: RPM
Y Units: percent load of max indicated torque (%)

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
40	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
60	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
78	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
97	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - SnapDecayAfterMisfire

Description: Used for P0300 - P0308, multiplier times the ddt_jerk value used used to detect misfire at that speed and load to see if size of disturbance has died down as expected of real misfire. Table lookup as a function of engine rpm and trans gear ratio.

Value Units: multiplier
X Unit: RPM
Y Units: gear ratio

y/x	1,000	1,400	1,800	2,200	2,600	3,000	4,000	5,000	6,000
1	2.00	2.50	3.00	4.00	4.00	3.60	3.00	3.00	3.00
1	2.00	2.50	3.00	4.00	4.00	3.60	3.00	3.00	3.00
1	2.00	2.50	2.80	2.20	2.50	3.60	2.70	3.00	3.00
1	2.00	2.50	2.80	2.20	2.50	3.60	2.70	3.00	3.00
2	2.00	2.50	2.70	2.00	1.50	1.75	2.30	3.00	3.00
2	2.00	2.50	2.60	1.90	1.50	1.50	2.00	2.50	3.00
3	1.80	2.30	2.00	1.60	1.50	1.50	2.00	2.50	2.00
5	1.80	2.20	2.50	1.80	3.00	3.00	2.80	2.60	2.25
6	1.50	2.00	2.50	3.00	3.00	3.00	3.00	3.00	3.00

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	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
300	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
500	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
600	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
700	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
800	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
900	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,100	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,300	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1,400	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - WaitToStart

Description: Used for P0300-P0308. Number of engine cycles to delay if diesel engine is cranked before wait to start lamp is extinguished. This lookup table determines the delay length by taking into account the coolant temperature.

Value Units: Number of Engine Cycles (integer)
X Unit: Engine Coolant (deg C)

y/x	-20	-10	0	10	20	30	40	50	60
1	0	0	0	0	0	0	0	0	0

Initial Supporting table - WSSRoughRoadThres

Description: Used for P0300-P0308. Only used if Wheel speed from ABS is used. If difference between wheel speed readings is larger than this limit, rough road is present

Value Units: acceleration
X Unit: Vehicle Speed (KPH)

y/x	0	12	24	36	48	60	72	85	97	109	121	133	145	157	169	181	193
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Initial Supporting table - ZeroTorqueAFM

Description: Used for P0300-P0308. Zero torque engine load while in Active Fuel Management. %of Max Brake Torque along the Neutral rev line, as a function of RPM and Baro

Value Units: Percent of Maximum Brake torque (%)
X Unit: RPM
Y Units: Barometric Pressure (kPa)

ZeroTorqueAFM - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
65	0.20	0.20	0.50	0.50	0.50	0.50	0.90	0.90	0.90	0.90	0.95	1.50	1.50
75	0.30	0.30	0.60	0.60	0.70	0.70	1.10	1.10	1.10	1.10	1.15	1.60	1.80
85	-0.75	-0.75	-1.00	-1.00	-1.12	-1.13	-1.50	-1.70	-1.85	-1.50	-1.00	1.00	1.95
95	0.35	0.35	0.70	0.70	0.75	0.75	1.20	1.25	1.25	1.25	1.35	1.35	2.00
105	0.40	0.45	0.75	0.75	0.75	0.95	1.20	1.25	1.30	1.30	1.50	1.75	2.10

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	1.50	1.50	1.50	1.50	0.30	0.81	2.56	4.32	6.07	7.83	9.59	11.35	13.10
75	1.80	1.80	1.80	1.80	0.40	0.88	2.61	4.35	6.07	7.81	9.54	11.27	13.00
85	1.95	1.95	1.95	1.00	0.50	0.96	2.66	4.37	6.07	7.78	9.48	11.19	12.90
95	2.00	2.00	2.00	1.50	0.60	1.03	2.71	4.39	6.07	7.76	9.44	11.12	12.80
105	2.10	2.10	2.10	1.60	0.70	1.10	2.76	4.42	6.07	7.73	9.39	11.04	12.70

Initial Supporting table - ZeroTorqueEngLoad

Description: Used for P0300-P0308. %of Max Brake Torque that represents Zero Brake torque along the Neutral rev line, as a function of RPM and Baro

Value Units: Percent of Maximum Brake torque (%)
X Unit: RPM
Y Units: Barometric Pressure (kPa)

ZeroTorqueEngLoad - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
65	-1.82	-1.82	-2.02	-2.02	-2.02	-2.02	-1.82	-1.02	-0.27	0.33	0.33	0.39	0.69
75	-1.80	-1.80	-2.00	-2.00	-2.00	-2.00	-1.80	-1.00	-0.25	0.35	0.35	0.41	0.71
85	-1.78	-1.78	-1.98	-1.98	-1.98	-1.98	-1.45	-0.98	-0.20	0.50	0.43	0.43	0.73
95	-1.73	-1.73	-1.93	-1.93	-1.93	-1.93	-1.40	-0.93	-0.15	0.52	0.45	0.45	0.75
105	-1.71	-1.71	-1.91	-1.91	-1.91	-1.91	-1.38	-0.75	0.25	0.55	0.45	0.45	0.95

ZeroTorqueEngLoad - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
65	1.09	1.43	1.43	1.43	1.43	4.00	6.50	9.00	11.50	14.00	16.50	19.00	21.50
75	1.11	1.45	1.45	1.45	1.45	4.00	6.50	9.00	11.50	14.00	16.50	19.00	21.50
85	1.13	1.47	1.47	1.47	1.47	4.00	6.50	9.00	11.50	14.00	16.50	19.00	21.50
95	1.15	1.49	1.49	1.49	1.49	4.00	6.50	9.00	11.50	14.00	16.50	19.00	21.50
105	1.25	1.50	1.50	1.50	1.50	4.00	6.50	9.00	11.50	14.00	16.50	19.00	21.50

Initial Supporting table - Maximum number of iterations allowed for torque solver

Description: Maximum number of iterations allowed for torque solver versus controller identifier name

Value Units: Number of iterations allowed
X Unit: Controller identifier enumeration name.
Y Units: Number of iterations allowed, integer values.

Maximum number of iterations allowed for torque solver - Part 1

y/x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

Maximum number of iterations allowed for torque solver - Part 2

y/x	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
1	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	

Initial Supporting table - P0128 Maximum Acculated Energy - Primary

Description: KtETHD_E_EOR_WrmUpEnrgyLimTest0

Value Units: Cooling system energy failure threshold (kJ)
X Unit: Minimum ECT for the key cycle (°C)

y/x	-40.0	-7.0	10.0	20.0	55.0	71.0	90.0
1.0	49,011.8	36,389.2	29,886.7	26,061.6	12,674.0	6,554.0	100.0

Initial Supporting table - P0128 Maximum Acculated Energy - Secondary

Description: KtETHD_E_EOR_WrmUpEnrgyLimTest1

Value Units: Cooling system energy failure threshold (kJ)
X Unit: Minimum ECT for the key cycle (°C)

y/x	-40.0	-7.0	10.0	20.0	55.0	71.0	90.0
1.0	60,119.2	45,150.1	37,438.8	32,902.8	17,026.5	9,768.8	1,150.3

Initial Supporting table - P0128 Maximum Acculated Energy - Tertiary

Description: KtETHD_E_EOR_WrmUpEnrgyLimTest2

Value Units: Cooling system energy failure threshold (kJ)
X Unit: Minimum ECT for the key cycle (°C)

y/x	-40.0	-7.0	10.0	20.0	55.0	71.0	90.0
1.0	99,999.0	99,999.0	99,999.0	99,999.0	99,999.0	99,999.0	99,999.0

Initial Supporting table - P01F0 - Heat To Coolant Min 2D

Description: KtETHD_P_CDD_HeatToCoolantMin

Value Units: Indicated Power (kW)
X Unit: Firing Fraction
Y Units: Ambient temperature (°C)

y/x	0.00	0.25	0.50	0.67	1.00
0.0	16.0	16.0	16.0	16.0	11.0
20.0	16.0	16.0	16.0	16.0	11.0
50.0	16.0	16.0	16.0	16.0	11.0
80.0	16.0	16.0	16.0	16.0	11.0
100.0	16.0	16.0	16.0	16.0	11.0

Initial Supporting table - P0234 P0299: Desired torque minimum limit overAmbient pressure to enable the WG deviation diagnosis.

Description: Desired torque minimum limit overAmbient pressure to enable the WG deviation diagnosis.

Value Units: [M] Engine torque threshold
X Unit: [p] KnBSTD_p_WG_DevAmbAirPresBP - Ambient pressure

y/x	60	80	100
1	230	240	250

Initial Supporting table - P0234 P0299: Engine speed minimum limit over Ambient pressure to enable the WG deviation diagnosis.

Description: Engine speed minimum limit over Ambient pressure to enable the WG deviation diagnosis.

Value Units: [rpm] Engine speed threshold
X Unit: [p] KnBSTD_p_WG_DevAmbAirPresBP - Ambient pressure

y/x	60	80	100
1	2,000	1,800	1,800

Supporting table - P0234 P0299: Wastegate position deviation diagnostic enable delay as a function of engine speed and ambient pressure

Description: Timer to stabilize enable conditions for wastegate position deviation diagnosis.

Value Units: [sec] Pressure control deviation diagnosis enable delay.
X Unit: [rpm] KnBSTD_n_WG_DevEngSpdBP - Engine Speed
Y Units: [kPa] KnBSTD_p_WG_DevAmbAirPresBP - Ambient Pressure

y/x	1,500	2,000	3,000	4,000	5,000	6,000	7,000
60	10	3	1	1	1	1	1
80	7	2	1	1	1	1	1
100	3	1	1	1	1	1	1

Initial Supporting table - P0299: Additive offset on WG negative deviation ambient correction.

Description: Additive offset on WG negative deviation ambient correction.

Value Units: [Pct] Position deviation ambient correction
X Unit: [kPa] KnBSTD_p_WG_DevAmbAirPresBP - Ambient Air Pressure
Y Units: [rpm] KnBSTD_n_WG_DevEngSpdBP - Engine Speed

y/x	60.0	80.0	100.0
1,500.0	0.0	0.0	0.0
2,000.0	0.0	0.0	0.0
3,000.0	0.0	0.0	0.0
4,000.0	0.0	0.0	0.0
5,000.0	0.0	0.0	0.0
6,000.0	0.0	0.0	0.0
7,000.0	0.0	0.0	0.0

Initial Supporting table - P0299: WG negative deviation fail threshold over engine speed and desired torque.

Description: WG negative deviation fail threshold over engine speed and desired torque.

Value Units: [Pct] Position deviation threshold
X Unit: [M] KnBSTD_M_WG_DevDsrdTrqBP - Desired Torque
Y Units: [rpm] KnBSTD_n_WG_DevEngSpdBP - Engine Speed

y/x	200	250	300	350	400	480
1,500	-100	-96	-63	-31	-25	-20
2,000	-100	-96	-63	-31	-25	-20
3,000	-100	-40	-45	-25	-25	-20
4,000	-100	-30	-30	-25	-25	-20
5,000	-100	-27	-29	-25	-20	-20
6,000	-100	-25	-25	-20	-20	-20
7,000	-100	-25	-25	-20	-20	-20

Initial Supporting table - P0446 canister vent restriction test displaced purge volume limit

Description: Canister vent restriction diagnostic displaced purge volume (liters) as a function of barometric pressure (kPa)

Value Units: Displaced purge volume (Liters)
X Unit: Barometric pressure (kPa)

y/x	70	80	90	100	110
1	8.0	8.0	8.0	8.0	8.0

Initial Supporting table - P0446 canister vent restriction test tank vacuum threshold

Description: Canister vent restriction diagnostic vacuum failure threshold (Pa) as a function of barometric pressure (kPa)

Value Units: Vacuum (Pa)
X Unit: Barometric pressure (kPa) - 70, 80, 90, 100, 110 kPa

y/x	1	2	3	4	5
1	2,750	2,750	2,750	2,750	2,750

Initial Supporting table - P0455 large leak diagnostic displaced purge volume threshold

Description: Large leak diagnostic displaced purge volume threshold as a function of barometric pressure

Value Units: Displaced purge volume threshold (liters)
X Unit: Barometric pressure (kPa)

y/x	70	80	90	100	110
1	9.0	9.0	9.0	9.0	9.0

Initial Supporting table - P0455 large leak diagnostic tank vacuum threshold

Description: Large leak diagnostic tank vacuum threshold as a function of barometric pressure

Value Units: Vacuum (Pa)
X Unit: Barometric pressure (kPa)

y/x	1	2	3	4	5
1	2,750	2,750	2,750	2,750	2,750

Initial Supporting table - P0496 purge valve leak diagnostic vacuum threshold

Description: Purge valve leak diagnostic vacuum failure threshold (Pa) as a function of barometric pressure (kPa)

Value Units: Vacuum (Pa)
X Unit: Barometric pressure (kPa)

y/x	1	2	3	4	5
1	2,500	2,500	2,500	2,500	2,500

Initial Supporting table - P0496 purge valve leak test time as a function of fuel level and barometric pressure

Description: Purge valve leak test time as a function of fuel level (%) and barometric pressure (kPa)

Value Units: Time (Seconds)
X Unit: Barometric pressure (kPa)
Y Units: Fuel level (%)

y/x	70	80	90	100	110
0	90	90	90	90	90
6	90	90	90	90	90
13	87	87	87	87	87
19	84	84	84	84	84
25	81	81	81	81	81
31	78	78	78	78	78
38	76	76	76	76	76
44	73	73	73	73	73
50	70	70	70	70	70
56	68	68	68	68	68
63	65	65	65	65	65
69	63	63	63	63	63
75	61	61	61	61	61
81	58	58	58	58	58
88	56	56	56	56	56
94	54	54	54	54	54
100	54	54	54	54	54

Initial Supporting table - P0521_CVDOP_MaxOilPressure

Description: Maximum oil pressure threshold.

X Unit: Engine Speed (RPM)

y/x	40	50	60	70	80	90	100	110	120
1,000	820	820	820	820	820	820	820	820	820
1,500	820	820	820	820	820	820	820	820	820
2,000	820	820	820	820	820	820	820	820	820
2,500	820	820	820	820	820	820	820	820	820
3,000	820	820	820	820	820	820	820	820	820
3,500	820	820	820	820	820	820	820	820	820
4,000	820	820	820	820	820	820	820	820	820
4,500	820	820	820	820	820	820	820	820	820
5,000	820	820	820	820	820	820	820	820	820

Initial Supporting table - P0521_CVDOP_MinOilPresFail

Description: Minimum oil pressure fail threshold.

X Unit: Engine Speed (RPM)

y/x	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
1	60	60	60	60	74	89	108	127	148

Initial Supporting table - P06DD_CVDOP_MaxDesPress

Description: The maximum desired pressure, above which the stuck diagnostic will be disabled.

Value Units: Desired oil pressure, kPa
X Unit: Engine oil temperature, °C

y/x	-20	0	20	60	80	100	120	140	160
1	500	450	450	450	450	450	430	400	350

Initial Supporting table - P06DD_CVDOP_MinDesPres

Description: The minimum desired pressure, below which the stuck diagnostic will be disabled.

Value Units: Desired oil pressure, kPa
X Unit: Engine oil temperature, °C

y/x	-20	0	20	60	80	100	120	140	160
1	200	200	175	150	150	150	160	200	300

Initial Supporting table - P129F Threshold High

Description: P129F Filtered Fuel Pump Speed Error High Threshold [over-performing motor]
Instantaneously calculated filtered pump speed error measured is higher than commanded

Value Units: revs / min
X Unit: revs / min [commanded pump speed]
Y Units: kiloPascals [requested fuel pressure]

y/x	200.0	300.0	400.0	500.0	600.0
1,000.0	-675.0	-675.0	-675.0	-675.0	-675.0
2,000.0	-675.0	-675.0	-675.0	-675.0	-675.0
3,000.0	-675.0	-675.0	-675.0	-675.0	-675.0
4,000.0	-675.0	-675.0	-675.0	-675.0	-675.0
5,000.0	-675.0	-675.0	-675.0	-675.0	-675.0
6,000.0	-675.0	-675.0	-675.0	-675.0	-675.0
7,000.0	-1,200.0	-1,200.0	-1,200.0	-1,200.0	-1,200.0

Initial Supporting table - P129F Threshold Low

Description: P129F Filtered Fuel Pump Speed Error Low Threshold [under-performing motor]
Instantaneously calculated filtered pump speed error measured is lower than commanded

Value Units: revs / min
X Unit: revs / min [commanded pump speed]
Y Units: kiloPascals [requested fuel pressure]

y/x	200.0	300.0	400.0	500.0	600.0
1,000.0	675.0	675.0	675.0	675.0	675.0
2,000.0	675.0	675.0	675.0	675.0	675.0
3,000.0	675.0	675.0	675.0	675.0	675.0
4,000.0	675.0	675.0	675.0	675.0	675.0
5,000.0	675.0	675.0	675.0	675.0	675.0
6,000.0	675.0	675.0	675.0	675.0	675.0
7,000.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0

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	250	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,063	3,500	4,000	4,500	5,000	5,500
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
240	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
320	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
400	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
480	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
560	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
640	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
720	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
800	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	0.00	0.00
880	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
960	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,040	0.00	0.00	0.00	0.00	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
1,120	0.00	0.00	0.00	0.00	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
1,200	0.00	0.00	0.00	0.00	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
1,280	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
1,390	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	0.00

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 [commanded fuel pressure]
Y Units: volts [device supply]

y/x	200	250	300	350	400	450	500	550	600
5	512	512	512	512	512	512	512	512	512
6	512	512	512	512	512	512	512	512	512
8	512	512	512	512	512	512	512	512	512
9	512	512	512	512	512	512	512	512	512
11	512	512	512	512	512	512	512	512	512
12	512	512	512	512	512	512	512	512	512
14	512	512	512	512	512	512	512	512	512
15	512	512	512	512	512	512	512	512	512
17	512	512	512	512	512	512	512	512	512
18	512	512	512	512	512	512	512	512	512
20	512	512	512	512	512	512	512	512	512
21	512	512	512	512	512	512	512	512	512
23	512	512	512	512	512	512	512	512	512
24	512	512	512	512	512	512	512	512	512
26	512	512	512	512	512	512	512	512	512
27	512	512	512	512	512	512	512	512	512
29	512	512	512	512	512	512	512	512	512

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 [commanded fuel pressure]
Y Units: grams / sec [fuel flow]

y/x	200	250	300	350	400	450	500	550	600
0	30	38	45	53	60	68	75	83	90
2	30	38	45	53	60	68	75	83	90
3	30	38	45	53	60	68	75	83	90
5	30	38	45	53	60	68	75	83	90
6	30	38	45	53	60	68	75	83	90
8	30	38	45	53	60	68	75	83	90
9	30	38	45	53	60	68	75	83	90
11	30	38	45	53	60	68	75	83	90
12	30	38	45	53	60	68	75	83	90
14	30	38	45	53	60	68	75	83	90
15	30	38	45	53	60	68	75	83	90
17	30	38	45	53	60	68	75	83	90
18	30	38	45	53	60	68	75	83	90
20	30	38	45	53	60	68	75	83	90
21	30	38	45	53	60	68	75	83	90
23	30	38	45	53	60	68	75	83	90
24	30	38	45	53	60	68	75	83	90
26	30	38	45	53	60	68	75	83	90
27	30	38	45	53	60	68	75	83	90
29	30	38	45	53	60	68	75	83	90
30	30	38	45	53	60	68	75	83	90
32	30	38	45	53	60	68	75	83	90
33	30	38	45	53	60	68	75	83	90
35	30	38	45	53	60	68	75	83	90
36	30	38	45	53	60	68	75	83	90
38	30	38	45	53	60	68	75	83	90
39	30	38	45	53	60	68	75	83	90
41	30	38	45	53	60	68	75	83	90
42	30	38	45	53	60	68	75	83	90
44	30	38	45	53	60	68	75	83	90
45	30	38	45	53	60	68	75	83	90

Initial Supporting table - P2635 Threshold High

47	30	38	45	53	60	68	75	83	90
48	30	38	45	53	60	68	75	83	90

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 [commanded fuel pressure]
Y Units: grams / second [fuel flow]

y/x	200	250	300	350	400	450	500	550	600
0	-260	-210	-160	-110	-60	-68	-75	-83	-90
2	-145	-125	-103	-81	-60	-68	-75	-83	-90
3	-30	-38	-45	-53	-60	-68	-75	-83	-90
5	-30	-38	-45	-53	-60	-68	-75	-83	-90
6	-30	-38	-45	-53	-60	-68	-75	-83	-90
8	-30	-38	-45	-53	-60	-68	-75	-83	-90
9	-30	-38	-45	-53	-60	-68	-75	-83	-90
11	-30	-38	-45	-53	-60	-68	-75	-83	-90
12	-30	-38	-45	-53	-60	-68	-75	-83	-90
14	-30	-38	-45	-53	-60	-68	-75	-83	-90
15	-30	-38	-45	-53	-60	-68	-75	-83	-90
17	-30	-38	-45	-53	-60	-68	-75	-83	-90
18	-30	-38	-45	-53	-60	-68	-75	-83	-90
20	-30	-38	-45	-53	-60	-68	-75	-83	-90
21	-30	-38	-45	-53	-60	-68	-75	-83	-90
23	-30	-38	-45	-53	-60	-68	-75	-83	-90
24	-30	-38	-45	-53	-60	-68	-75	-83	-90
26	-30	-38	-45	-53	-60	-68	-75	-83	-90
27	-30	-38	-45	-53	-60	-68	-75	-83	-90
29	-30	-38	-45	-53	-60	-68	-75	-83	-90
30	-30	-38	-45	-53	-60	-68	-75	-83	-90
32	-30	-38	-45	-53	-60	-68	-75	-83	-90
33	-30	-38	-45	-53	-60	-68	-75	-83	-90
35	-30	-38	-45	-53	-60	-68	-75	-83	-90
36	-30	-38	-45	-53	-60	-68	-75	-83	-90
38	-30	-38	-45	-53	-60	-68	-75	-83	-90
39	-30	-38	-45	-53	-60	-68	-75	-83	-90
41	-30	-38	-45	-53	-60	-68	-75	-83	-90
42	-30	-38	-45	-53	-60	-68	-75	-83	-90
44	-30	-38	-45	-53	-60	-68	-75	-83	-90
45	-30	-38	-45	-53	-60	-68	-75	-83	-90

Initial Supporting table - P2635 Threshold Low

47	-30	-38	-45	-53	-60	-68	-75	-83	-90
48	-30	-38	-45	-53	-60	-68	-75	-83	-90

Initial Supporting table - P26CE Pump Overspeed Fail Threshold

Description:

Value Units: Pump overspeed failure threshold (RPM)
X Unit: Commanded pump speed (RPM)

y/x	0	300	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
1	-250	-250	-250	-300	-300	-400	-500	-600	-700	-800

Initial Supporting table - P26CE Pump Overspeed Fail Threshold Low Voltage

Description: Pump overspeed failure threshold in a low voltage condition as a function of pump requested speed

Value Units: Pump overspeed failure threshold low voltage (RPM)
X Unit: Commanded pump speed (RPM)

y/x	0	300	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
1	9,999	9,999	9,999	9,999	9,999	9,999	9,999	9,999	9,999	9,999

Initial Supporting table - P2B85 Pump Underspeed Fail Threshold

Description: Pump underspeed failure threshold as a function of pump requested speed

Value Units: Pump underspeed failure threshold (RPM)
X Unit: Commanded pump speed (RPM)

y/x	0	300	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
1	200	200	200	300	300	400	500	600	700	800

Initial Supporting table - P2B85 Pump Underspeed Fail Threshold Low Voltage

Description: Pump underspeed failure threshold in a low voltage condition as a function of pump requested speed

Value Units: Pump underspeed failure threshold low voltage (RPM)
X Unit: Commanded pump speed (RPM)

y/x	0	300	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
1	9,999	9,999	9,999	9,999	9,999	9,999	9,999	9,999	9,999	9,999

Initial Supporting table - P3075 3076 Pump Current Performance Coolant Distribution Mode

Description: Current performance intrusive test enable condition as a function of coolant distribution mode selection

Value Units: Coolant distribution mode selection to enable diagnostic
X Unit: Coolant distribution mode enumeration

y/x	0	1	2	3	4	5
1	0	0	0	1	1	1

Initial Supporting table - P3075 3076 Pump Current Performance Coolant System Mode Select

Description: Current performance intrusive test enable condition as a function of coolant system mode selection

Value Units: Coolant system mode selection to enable diagnostic
X Unit: Coolant System Mode Enumeration

y/x	0	1	2	3	4	5	6	7	8	9	10
1	0	0	0	1	0	0	0	0	1	1	1

Initial Supporting table - P3075 3076 Pump Current Scaled

Description: Pump current scaled based on engine inlet coolant temperature

Value Units: Pump current scaled (A)
X Unit: Engine inlet coolant temperature (Deg C)

y/x	40	50	60	70	80	90	100	110	120	130
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - P3075 Pump Low Current Passive Test Fail Threshold

Description: Low current passive test failure threshold as a function of pump command speed and flow restriction

Value Units: Pump passive test low current failure threshold (A)
X Unit: Coolant Flow Restriction (Unitless)
Y Units: Commanded Pump Speed (RPM)

y/x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
810	1	3	3	3	3	3	3	3	3	3
1,000	1	3	3	3	3	3	3	3	3	4
1,200	1	3	4	4	4	4	4	4	4	4
1,600	1	4	5	5	5	5	5	5	5	5
2,000	1	6	6	6	7	7	7	7	7	7
2,500	1	8	8	9	9	9	9	9	10	10
3,000	1	10	11	12	13	13	13	13	14	14
4,000	1	16	18	20	21	22	22	22	24	24
5,000	1	25	28	31	33	34	35	34	36	37
6,250	1	42	42	48	51	53	55	57	57	58

Initial Supporting table - P3075 Pump Low Current Performance Failure Threshold

Description: Low current performance failure threshold as a function of coolant restriction correction

Value Units: Pump low current failure threshold (A)
X Unit: Coolant restriction correction

y/x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1	0.5	16.5	18.3	20.1	21.1	21.8	22.5	22.4	23.5	23.6

Initial Supporting table - P3076 Pump High Current Passive Test Fail Threshold

Description: High current passive test failure threshold as a function of pump command speed and flow restriction

Value Units: Pump passive test high current failure threshold (A)
X Unit: Coolant Flow Restriction (Unitless)
Y Units: Commanded Pump Speed (RPM)

y/x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
810	80	4	4	4	4	5	4	4	5	5
1,000	80	4	4	4	4	5	5	5	5	5
1,200	80	5	4	5	5	5	5	5	5	5
1,600	80	6	6	6	6	6	7	7	7	7
2,000	80	7	7	8	8	8	9	9	9	9
2,500	80	10	10	11	11	12	13	13	12	13
3,000	80	14	14	15	15	16	17	19	17	17
4,000	80	23	22	25	26	27	28	30	29	29
5,000	80	36	34	38	40	41	43	46	44	45
6,250	80	52	55	59	62	65	68	70	70	70

Initial Supporting table - P3076 Pump High Current Performance Failure Threshold

Description:

Value Units: Pump high current failure threshold (A)
X Unit: Coolant restriction correction

y/x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1	80.0	23.2	22.4	24.6	25.8	26.7	28.2	29.5	28.8	29.1

Initial Supporting table - Purge Pump Diagnostic IAT Multiplier Factor

Description: Purge pump diagnostic IAT multiplier factor as a function of intake air temperature (deg C)

Value Units: Purge pump diagnostic IAT multiplier factor (unitless)
X Unit: Intake air temperature (deg C)

y/x	-40	-20	0	20	40	60	80	100	120
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Initial Supporting table - Purge Pump Misassembled Failure Threshold

Description: Misassembled failure threshold (kPa) as a function of barometric pressure (kPa) and purge pump speed (RPM)

Value Units: Misassembled failure threshold (kPa)
X Unit: Barometric pressure (kPa)
Y Units: Purge pump speed (RPM)

y/x	70	80	90	100	110
39,000	0.6	0.6	0.6	0.6	0.6
40,000	0.7	0.7	0.7	0.7	0.7
41,000	0.7	0.7	0.7	0.7	0.7
42,000	0.7	0.7	0.7	0.7	0.7
43,000	0.8	0.8	0.8	0.8	0.8
44,000	0.8	0.8	0.8	0.8	0.8
45,000	0.8	0.8	0.8	0.8	0.8
46,000	0.9	0.9	0.9	0.9	0.9
47,000	0.9	0.9	0.9	0.9	0.9
48,000	0.9	0.9	0.9	0.9	0.9
49,000	1.0	1.0	1.0	1.0	1.0
50,000	1.0	1.0	1.0	1.0	1.0
51,000	1.1	1.1	1.1	1.1	1.1
52,000	1.1	1.1	1.1	1.1	1.1
53,000	1.1	1.1	1.1	1.1	1.1
54,000	1.2	1.2	1.2	1.2	1.2
55,000	1.2	1.2	1.2	1.2	1.2

Initial Supporting table - Purge pump performance high flow ratio threshold

Description: Purge pump flow ratio = estimated purge flow as func(pressure across purge solenoid valve) / failure threshold purge flow as func(purge valve duty cycle, barometric pressue)

Value Units: Purge pump flow ratio (unitless)
X Unit: Barometric pressure (kPa)
Y Units: Purge solenoid duty cycle (Percent)

y/x	70	80	90	100	110
0	19.5	19.6	19.8	19.9	20.0
6	19.3	19.4	19.5	19.7	19.8
12	19.1	19.2	19.4	19.5	19.6
18	18.9	19.0	19.1	19.3	19.4
24	18.7	18.8	19.0	19.1	19.2
30	18.5	18.6	18.8	18.9	19.0
36	18.3	18.4	18.5	18.7	18.8
42	18.1	18.2	18.4	18.5	18.6
48	17.9	18.0	18.1	18.3	18.4
54	17.7	17.8	18.0	18.1	18.2
60	17.5	17.6	17.8	17.9	18.0
66	17.3	17.4	17.5	17.7	17.8
72	17.1	17.2	17.4	17.5	17.6
78	16.9	17.0	17.1	17.3	17.4
84	16.7	16.8	17.0	17.1	17.2
90	16.5	16.6	16.8	16.9	17.0
100	16.5	16.6	16.8	16.9	17.0

Initial Supporting table - Purge pump performance low flow ratio threshold

Description: Purge pump flow ratio = Estimated purge flow as func(pressure across purge solenoid valve) / failure threshold purge flow as func(purge valve duty cycle, barometric pressure)

Value Units: Purge pump flow ratio (unitless)
X Unit: Barometric pressure (kPa)
Y Units: Purge solenoid duty cycle (Percent)

y/x	70	80	90	100	110
0	2.2	2.3	2.4	2.5	2.6
6	2.1	2.2	2.3	2.4	2.5
12	2.0	2.1	2.2	2.3	2.4
18	1.9	2.0	2.2	2.3	2.4
24	1.9	2.0	2.1	2.2	2.3
30	1.8	1.9	2.0	2.1	2.2
36	1.7	1.8	1.9	2.0	2.1
42	1.6	1.7	1.8	1.9	2.1
48	1.5	1.6	1.7	1.9	2.0
54	1.4	1.5	1.7	1.8	1.9
60	1.3	1.5	1.6	1.7	1.8
66	1.2	1.4	1.5	1.6	1.7
72	1.2	1.3	1.4	1.5	1.7
78	1.1	1.2	1.3	1.5	1.6
84	1.0	1.1	1.2	1.4	1.5
90	0.9	1.0	1.2	1.3	1.4
100	0.9	1.0	1.2	1.3	1.4

Initial Supporting table - Purge pump speed on value too high

Description: Purge pump speed (RPM) error limit as a function of purge pump voltage (volts)

Value Units: Purge pump speed (RPM)
X Unit: Purge pump voltage (volts)

y/x	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940	49,940

Initial Supporting table - Purge pump speed on value too low

Description: Purge pump speed (RPM) error limit as a function of purge pump voltage (volts)

Value Units: Purge pump speed (RPM)
X Unit: Purge pump voltage (volts)

y/x	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	33,460	33,460	33,460	36,110	38,760	40,710	42,660	43,360	44,060	44,060	44,060	44,060	44,060	44,060	44,060	44,060	44,060

Initial Supporting table - Purge System High Purge Flow Enable

Description: Purge gas flow ratio (unitless) as a function of barometric pressure (kPa)

Value Units: Purge pump flow ratio (unitless)
X Unit: Barometric pressure (kPa)

y/x	1	2	3	4	5
1	1.0	1.0	1.0	1.0	1.0
2	1.0	1.0	1.0	1.0	1.0
3	1.0	1.0	1.0	1.0	1.0
4	1.0	1.0	1.0	1.0	1.0
5	1.0	1.0	1.0	1.0	1.0
6	1.0	1.0	1.0	1.0	1.0
7	1.0	1.0	1.0	1.0	1.0
8	1.0	1.0	1.0	1.0	1.0
9	1.0	1.0	1.0	1.0	1.0
10	1.0	1.0	1.0	1.0	1.0
11	1.0	1.0	1.0	1.0	1.0
12	1.0	1.0	1.0	1.0	1.0
13	1.0	1.0	1.0	1.0	1.0
14	1.0	1.0	1.0	1.0	1.0
15	1.0	1.0	1.0	1.0	1.0
16	1.0	1.0	1.0	1.0	1.0
17	1.0	1.0	1.0	1.0	1.0

Initial Supporting table - Purge System High Purge Flow Remain Enabled

Description: Purge gas flow ratio (unitless) as a function of barometric pressure (kPa)

Value Units: Purge pump flow ratio (unitless)
X Unit: Barometric pressure (kPa)

y/x	1	2	3	4	5
1	1.2	1.2	1.2	1.2	1.2
2	1.2	1.2	1.2	1.2	1.2
3	1.2	1.2	1.2	1.2	1.2
4	1.2	1.2	1.2	1.2	1.2
5	1.2	1.2	1.2	1.2	1.2
6	1.2	1.2	1.2	1.2	1.2
7	1.2	1.2	1.2	1.2	1.2
8	1.2	1.2	1.2	1.2	1.2
9	1.2	1.2	1.2	1.2	1.2
10	1.2	1.2	1.2	1.2	1.2
11	1.2	1.2	1.2	1.2	1.2
12	1.2	1.2	1.2	1.2	1.2
13	1.2	1.2	1.2	1.2	1.2
14	1.2	1.2	1.2	1.2	1.2
15	1.2	1.2	1.2	1.2	1.2
16	1.2	1.2	1.2	1.2	1.2
17	1.2	1.2	1.2	1.2	1.2

Initial Supporting table - Purge System Low Purge Flow Enable

Description: Purge gas flow ratio (unitless) as a function of barometric pressure (kPa)

Value Units: Purge pump flow ratio (unitless)
X Unit: Barometric pressure (kPa)

y/x	1	2	3	4	5
1	0.3	0.3	0.3	0.3	0.3
2	0.3	0.3	0.3	0.3	0.3
3	0.3	0.3	0.3	0.3	0.3
4	0.3	0.3	0.3	0.3	0.3
5	0.3	0.3	0.3	0.3	0.3
6	0.3	0.3	0.3	0.3	0.3
7	0.3	0.3	0.3	0.3	0.3
8	0.3	0.3	0.3	0.3	0.3
9	0.3	0.3	0.3	0.3	0.3
10	0.3	0.3	0.3	0.3	0.3
11	0.3	0.3	0.3	0.3	0.3
12	0.3	0.3	0.3	0.3	0.3
13	0.3	0.3	0.3	0.3	0.3
14	0.3	0.3	0.3	0.3	0.3
15	0.3	0.3	0.3	0.3	0.3
16	0.3	0.3	0.3	0.3	0.3
17	0.3	0.3	0.3	0.3	0.3

Initial Supporting table - Purge System Low Purge Flow Remain Enabled

Description: Purge gas flow ratio (unitless) as a function of barometric pressure (kPa)

Value Units: Purge pump flow ratio (unitless)
X Unit: Barometric pressure (kPa)

y/x	1	2	3	4	5
1	0.1	0.1	0.1	0.1	0.1
2	0.1	0.1	0.1	0.1	0.1
3	0.1	0.1	0.1	0.1	0.1
4	0.1	0.1	0.1	0.1	0.1
5	0.1	0.1	0.1	0.1	0.1
6	0.1	0.1	0.1	0.1	0.1
7	0.1	0.1	0.1	0.1	0.1
8	0.1	0.1	0.1	0.1	0.1
9	0.1	0.1	0.1	0.1	0.1
10	0.1	0.1	0.1	0.1	0.1
11	0.1	0.1	0.1	0.1	0.1
12	0.1	0.1	0.1	0.1	0.1
13	0.1	0.1	0.1	0.1	0.1
14	0.1	0.1	0.1	0.1	0.1
15	0.1	0.1	0.1	0.1	0.1
16	0.1	0.1	0.1	0.1	0.1
17	0.1	0.1	0.1	0.1	0.1

Initial Supporting table - TimeForOilAeration

Description: The timer limit to declare an engine oil aeration condition exists.

X Unit: Engine oil temperature (deg C)

y/x	-40	-10	0	7	15	20	80	100	120	140	160
1	30	30	30	30	30	30	30	30	30	30	30

Initial Supporting table - Closed Loop Enable Clarification - KaFCLP_U_SlphrIntglOfst_Thrsh

Description: Integral Offset voltage thresholds (bank and cell specific cals) used with KeFCLP_Pct_CatAccuSlphrPostDsbl to check for sulphur poisoning.

Value Units: millivolts
X Unit: Post Catalyst Number

y/x	CiOXYR_O2_PostCat1	CiOXYR_O2_PostCat2
CiFCLP_Decel	2,048	2,048
CiFCLP_Idle	2,048	2,048
CiFCLP_Cruise	2,048	2,048
CiFCLP_LightAccel	2,048	2,048
CiFCLP_HeavyAccel	2,048	2,048

Initial Supporting table - Closed Loop Enable Clarification - KcFCLP_Cnt_O2RdyCyclesThrsh

Description: Number of times a post oxygen sensor value must be in range before declaring it ready

Value Units: Time (events * 12.5 milliseconds)

y/x	1
1	10

Initial Supporting table - Closed Loop Enable Clarification - KcFULC_O2_SensorReadyEvents

Description: Number of times a pre oxygen sensor value must be in range before declaring it ready

Value Units: Time (events * 12.5 milliseconds)

y/x	1
1	10

Initial Supporting table - Closed Loop Enable Clarification - KeEOSD_U_RichThrsh

Description: The oxygen sensor voltage above which a sensor will be considered failing during a Rich Test.

Value Units: Volts

y/x	1
1	1,050

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_dm_IntegrationAirflowMax

Description: Maximum allowed estimated airflow for post O2 integral terms to be updated.

Value Units: Grams per Second

y/x	1
1	512

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_Pct_CatAccuSlphrPostDsbl

Description: Sulphur percent threshold above which post integral learning is disabled if the threshold criteria KaFCLP_U_SlphrIntglOfst_Thrsh is also met.

Value Units: Percent

y/x	1
1	255

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMax

Description: Maximum allowed estimated catalytic converter temperature for post O2 integral terms to be updated.

Value Units: Celcius

y/x	1
1	1,000

Initial Supporting table - Closed Loop Enable Clarification - KeFCLP_T_IntegrationCatalystMin

Description: Minimum allowed estimated catalytic converter temperature to begin using post O2 integration correction terms. Converter temperature must remain above this threshold to ramp-in the post O2 integration adjustments. Once the ramp-in has started, a converter temperature below this threshold will freeze the ramp-in multiplier. Post O2 integration will not be allowed below this converter temperature

Value Units: Celcius

y/x	1
1	425

Initial Supporting table - Closed Loop Enable Clarification - KeFULC_T_WRAF_SensorReadyThrsh

Description: Pumping cell temperature threshold above which the wideband oxygen sensor will be considered ready for use

Value Units: Degrees Celcius

y/x	1
1	700

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_AdaptiveLoCoolant

Description: LTM learning is inhibited if the engine coolant temperature is below this calibration.

Value Units: Degrees Celcius

y/x	1
1	50

Initial Supporting table - Closed Loop Enable Clarification - KfFCLP_U_O2ReadyThrshLo

Description: Voltage limit checked against when determining if a post converter oxygen sensor is in range

Value Units: millivolts

y/x	1
1	1,100

Initial Supporting table - Closed Loop Enable Clarification - KfFULC_U_O2_SensorReadyThrshLo

Description: Voltage limit checked against when determining if a pre converter oxygen sensor is in range

Value Units: millivolts

y/x	1
1	1,250

Initial Supporting table - Closed Loop Enable Clarification - KtFCLL_p_AdaptiveLowMAP_Limit

Description: Long term fuel learning is disabled below this MAP limit as a function of barometric pressure.

Value Units: KPa
X Unit: KPa

y/x	65	70	75	80	85	90	95	100	105
1	16.0	16.0	16.0	16.0	16.0	17.0	18.0	18.0	18.0

Initial Supporting table - Closed Loop Enable Clarification - KtFCLP_t_PostIntglDisableTime

Description: Disable integral offset after engine start for this amount of time as a function of start up coolant temperature.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-29	-18	-6	5	16	28	39	50	61	73	84	95	106	118	129	140
1	409.0	409.0	409.0	409.0	400.0	100.0	100.0	100.0	40.0	40.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0

Initial Supporting table - Closed Loop Enable Clarification - KtFCLP_t_PostIntglRampInTime

Description: Time required to ramp integral offset to desired value as a function of start up coolant temperature.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-29	-18	-6	5	16	28	39	50	61	73	84	95	106	118	129	140
1	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	40.0	30.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0

Initial Supporting table - Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopAutostart

Description: Engine run time following an autostart, as a function of begin run coolant, which must be exceeded to enable CLOSED LOOP.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300.0	300.0	230.0	90.0	80.0	32.0	20.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

Initial Supporting table - Closed Loop Enable Clarification - KtFSTA_t_ClosedLoopTime

Description: Engine run time, as a function of startup coolant temperature, which must be exceeded to enable CLOSED LOOP.

Value Units: Time in seconds
X Unit: Degrees Celcius

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	300.0	300.0	230.0	90.0	80.0	32.0	32.0	32.0	32.0	32.0	9.0	9.0	9.0	30.0	45.0	45.0	45.0

Initial Supporting table - P0442 Volatility Time as a Function of Estimate of Ambient Temperature

Description: EONV volatility time as a function of estimated ambient temperature

Value Units: Volatility time (seconds)
X Unit: Estimated Ambient Temperature (Deg C)

y/x	-10	-4	1	7	13	18	24	29	35	41	46	52	58	63	69	74	80
1	45	45	45	45	49	57	105	173	340	500	500	500	500	500	500	500	500

Initial Supporting table - P0442 Engine Off Time Before Vehicle Off Maximum as a Function of Estimated Ambient Temperature

Description: Maximum engine off time before vehicle off time as a function of estimated ambient temperature (EAT)

Value Units: Maximum Engine Off Time Before Vehicle Off Time (seconds)
X Unit: Estimated Ambient Temperature (Deg C)

y/x	-10	-4	1	7	13	18	24	29	35	41	46	52	58	63	69	74	80
1	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

Initial Supporting table - P0442 EONV Pressure Threshold (Pascals)

Description: EONV pressure threshold as a function of fuel level and estimated ambient temperature (EAT)

Value Units: EONV Pressure Threshold (Pascals)
X Unit: Fuel Level (percent) from 0 to 100 with step size 6.25
Y Units: Estimated Ambient Temperature (deg C) from -10 to 80 with step size 5.625

y/x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
2	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
3	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
4	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
5	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
6	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
7	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
8	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
9	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
10	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
11	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
12	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
13	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
14	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
15	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
16	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5
17	-311.4	-299.7	-288.0	-276.3	-264.7	-253.0	-241.3	-229.6	-218.0	-206.3	-194.6	-182.9	-171.2	-159.6	-147.9	-136.2	-124.5

Initial Supporting table - P057B KtBRKI_K_CmpltTestPointWeight

Description:

y/x	0.000	0.001	0.011	0.022	0.034	0.044	0.067	0.101	1.000
1	0	0	0	1	1	1	1	1	1

Initial Supporting table - P057B KtBRKI_K_FastTestPointWeight

Description:

y/x	0.000	0.001	0.011	0.022	0.034	0.044	0.067	0.101	1.000
1	0	0	0	0	1	1	1	1	1

Initial Supporting table - DFCO_CoolEnblHi_Temp

Description:

y/x	-40	0	25
1	30.0	30.0	30.0

Initial Supporting table - DFCO_DelayAfterStart_Time

Description:

y/x	-30	-10	20	60	90
1	20.0	15.0	10.0	8.0	5.0

Initial Supporting table - DFCO_DsblLo_Vehicle_Speed

Description:

y/x	CeTCOR_e_NonEcoMode	CeTCOR_e_EcoMode
CeTGRR_e_TransGr1	25	25
CeTGRR_e_TransGr2	25	25
CeTGRR_e_TransGr3	27	27
CeTGRR_e_TransGr4	27	27
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	35.0	35.0
CeTGRR_e_TransGr2	35.0	35.0
CeTGRR_e_TransGr3	37.0	37.0
CeTGRR_e_TransGr4	37.0	37.0
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	-2,500	-2,150	-1,500	-500	-200	-150	-100	-50	0
1	500	500	500	50	50	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	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
2	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
3	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
4	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
5	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
6	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
7	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
8	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
9	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
10	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
11	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
12	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
13	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
14	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
15	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
16	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
17	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	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	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
2	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
3	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
4	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
5	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
6	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
7	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
8	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
10	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
11	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
12	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
13	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
14	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
15	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
16	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
17	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0

Initial Supporting table - P0196_FastFailTempDiff

Description: EOT Sensor Cold Start Fast Fail Threshold

Value Units: Threshold between power-up engine oil temperature and power-up engine coolant temperature (Deg C)
X Unit: PowerUp coolant temperature (deg C)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	80.0	80.0	80.0	60.0	60.0	40.0	40.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0

Initial Supporting table - P0196_TotalAccumulatedFlow

Description: Total accumulated air consumed by engine since engine start as a function of powerup undefaulted Oil Temperature

Value Units: Minimum accumulated (total) air grams consumed by engine (gram)
X Unit: PowerUp coolant temperature (deg C)

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	15,000	14,000	13,000	12,000	11,000	10,000	9,000	8,000	7,000	6,000	5,000	4,000	5,000	4,000	3,000	3,000	3,000

Initial Supporting table - Minimum Non-Purge Samples for Purge Vapor Fuel

Description: Number of Fuel Trim Monitor sample counts required to allow the Purge Vapor Fuel value to inhibit the Intrusive Rich test

Value Units: Sample Counts per loop rate of 100ms (divide by 10 to get seconds)
X Unit: Long Term Fuel Trim Cell I.D. (no units) (Only PurgeOff cells are used)

Minimum Non-Purge Samples for Purge Vapor Fuel - Part 1

y/x	CeFADR_e_Cell00_PurgOnAirMode5	CeFADR_e_Cell01_PurgOnAirMode4	CeFADR_e_Cell02_PurgOnAirMode3	CeFADR_e_Cell03_PurgOnAirMode2
1	65,535	65,535	65,535	65,535

Minimum Non-Purge Samples for Purge Vapor Fuel - Part 2

y/x	CeFADR_e_Cell04_PurgOnAirMode1	CeFADR_e_Cell05_PurgOnAirMode0	CeFADR_e_Cell06_PurgOnIdle	CeFADR_e_Cell07_PurgOnDecel
1	65,535	65,535	65,535	65,535

Minimum Non-Purge Samples for Purge Vapor Fuel - Part 3

y/x	CeFADR_e_Cell08_PurgOffAirMode5	CeFADR_e_Cell09_PurgOffAirMode4	CeFADR_e_Cell10_PurgOffAirMode3	CeFADR_e_Cell11_PurgOffAirMode2
1	550	65,535	65,535	65,535

Minimum Non-Purge Samples for Purge Vapor Fuel - Part 4

y/x	CeFADR_e_Cell12_PurgOffAirMode1	CeFADR_e_Cell13_PurgOffAirMode0	CeFADR_e_Cell14_PurgOffIdle	CeFADR_e_Cell15_PurgOffDecel
1	65,535	65,535	65,535	65,535

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.

P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage - Part 1

y/x	CeFADR_e_Cell00_PurgOnAirMode 5	CeFADR_e_Cell01_PurgOnAirMode 4	CeFADR_e_Cell02_PurgOnAirMode 3	CeFADR_e_Cell03_PurgOnAirMode 2
1	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_PurgOnAirMode 1	CeFADR_e_Cell05_PurgOnAirMode 0	CeFADR_e_Cell06_PurgOnIdle	CeFADR_e_Cell07_PurgOnDecel
1	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell	CeFADD_e_SelectedPurgeCell

P0171_P0172_P0174_P0175 Long-Term Fuel Trim Cell Usage - Part 3

y/x	CeFADR_e_Cell08_PurgOffAirMode 5	CeFADR_e_Cell09_PurgOffAirMode 4	CeFADR_e_Cell10_PurgOffAirMode 3	CeFADR_e_Cell11_PurgOffAirMode 2
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_PurgOffAirMode 1	CeFADR_e_Cell13_PurgOffAirMode 0	CeFADR_e_Cell14_PurgOffIdle	CeFADR_e_Cell15_PurgOffDecel
1	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell	CeFADD_e_SelectedNonPurgeCell

Initial Supporting table - Startup Engine Coolant adjusment to Minimum accumulation time

Description: Time offset added to the minimum accumulation time based on Startup Coolant.

Value Units: Counts (10 counts equals 1 second)
X Unit: Degree C

y/x	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
1	100	100	100	100	100	80	60	40	20	0	0	0	0	0	0	0	0

Initial Supporting table - P0068_Delta MAF Threshold f(TPS)

Description: Table of delta MAF values as a function of desired throttle position. The output of this table provides a delta MAF that if the measured minus the estimated MAF exceeds, is considered a fail.

Value Units: Delta MAF Values (dm)
X Unit: Desired Throttle Position (Pct)

y/x	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	100.00
1.00	18.69	24.76	33.19	46.77	255.00	255.00	255.00	255.00	255.00

Initial Supporting table - P0068_Delta MAP Threshold f(TPS)

Description: Table of delta MAP values as a function of desired throttle position. The output of this table provides a delta MAP that if the measured minus the estimated MAP exceeds, is considered a fail.

Value Units: Delta MAP Values (kPa)
X Unit: Desired Throttle Position (Pct)

y/x	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	100.00
1.00	36.71	40.04	41.74	46.78	255.00	255.00	255.00	255.00	255.00

Initial Supporting table - P0068_Maximum MAF f(RPM)

Description: Table of maximum MAF values vs. engine speed. This is the maximum MAF the engine can see under all ambient conditions.

Value Units: Delta MAF Values (dm)
X Unit: Engine Speed (RPM)

y/x	600.00	1,400.00	2,200.00	3,000.00	3,800.00	4,600.00	5,400.00	6,200.00	7,000.00
1.00	9.90	75.15	121.95	160.21	202.70	233.34	245.96	244.54	200.00

Initial Supporting table - P0068_Maximum MAF f(Volts)

Description: Table of maximum MAF values vs. system voltage. The output of the air meter is clamped to lower values as system voltage drops off.

Value Units: Delta MAF Values (dm)
X Unit: System Voltage (V)

y/x	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00
1.00	406.55	406.55	406.55	406.55	406.55	406.55	406.55	406.55	406.55

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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	200.000	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_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	200.000	500.000	500.000	1,000.000	2,000.000	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.

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	3	3	3	3	3	3	3	3

P0606_PSW Sequence Fail f(Loop Time) - Part 2

y/x	CePISR_e_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	3	3	3	3	3	3	3	3

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	4	4	4	4	4	4	4	4

P0606_PSW Sequence Sample f(Loop Time) - Part 2

y/x	CePISR_e_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	4	4	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	36.71	36.71	36.71	36.71	36.71	36.71

Initial Supporting table - P16F3_Speed Control External Load f(Oil Temp, RPM)

Description: Specifies the external load table for SPDR torque security as a function of engine oil temperature and engine RPM.

Value Units: External Load Table for SPDR (Nm)
X Unit: Engine Oil Temperature (deg C)
Y Units: Engine Speed (RPM)

y/x	-40.00	-20.00	-10.00	0.00	50.00	90.00
350.00	132.62	116.39	128.21	137.13	89.22	37.63
450.00	132.62	116.39	128.21	137.13	89.22	37.63
550.00	132.62	116.39	128.21	137.13	89.22	37.63
650.00	131.12	114.89	126.28	134.38	86.75	35.33
700.00	131.62	115.39	126.71	135.13	87.47	31.92
800.00	139.98	122.39	132.07	138.87	89.72	23.65
900.00	152.14	133.04	141.96	148.03	96.40	23.31
1,000.00	161.68	141.70	150.84	147.35	101.12	20.63
1,100.00	168.75	147.91	150.30	144.88	95.41	23.33
1,200.00	182.73	160.56	153.34	149.63	88.80	24.51
1,300.00	196.71	173.21	159.47	154.37	84.54	25.69
1,400.00	206.27	185.88	175.87	174.88	94.62	41.27
2,000.00	98.86	81.29	57.55	40.28	-21.77	-26.42
2,500.00	-98.63	-98.63	-98.63	-98.63	-98.63	-98.63
3,000.00	-108.49	-108.49	-108.49	-108.49	-108.49	-108.49
4,000.00	-118.36	-118.36	-118.36	-118.36	-118.36	-118.36
6,000.00	-128.22	-128.22	-128.22	-128.22	-128.22	-128.22

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	200.000	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_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	200.000	500.000	500.000	1,000.000	2,000.000	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.

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	3	3	3	3	3	3	3	3

P0606_PSW Sequence Fail f(Loop Time) - Part 2

y/x	CePISR_e_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	3	3	3	3	3	3	3	3

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_2p5msSeq	CePISR_e_3p125msSeq	CePISR_e_5msSeq	CePISR_e_6p25msSeq	CePISR_e_10msSeq	CePISR_e_12p5msSeq	CePISR_e_20msSeq	CePISR_e_25msSeq
1	4	4	4	4	4	4	4	4

P0606_PSW Sequence Sample f(Loop Time) - Part 2

y/x	CePISR_e_40msSeq	CePISR_e_50msSeq	CePISR_e_80msSeq	CePISR_e_100msSeq	CePISR_e_250msSeq	CePISR_e_EventA_Seq	CePISR_e_EventB_Seq	CePISR_e_EventC_Seq
1	4	4	4	4	4	4	4	4

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	36.71	36.71	36.71	36.71	36.71	36.71

Initial Supporting table - P16F3_Speed Control External Load f(Oil Temp, RPM)

Description: Specifies the external load table for SPDR torque security as a function of engine oil temperature and engine RPM.

Value Units: External Load Table for SPDR (Nm)
X Unit: Engine Oil Temperature (deg C)
Y Units: Engine Speed (RPM)

y/x	-40.00	-20.00	-10.00	0.00	50.00	90.00
350.00	132.62	116.39	128.21	137.13	89.22	37.63
450.00	132.62	116.39	128.21	137.13	89.22	37.63
550.00	132.62	116.39	128.21	137.13	89.22	37.63
650.00	131.12	114.89	126.28	134.38	86.75	35.33
700.00	131.62	115.39	126.71	135.13	87.47	31.92
800.00	139.98	122.39	132.07	138.87	89.72	23.65
900.00	152.14	133.04	141.96	148.03	96.40	23.31
1,000.00	161.68	141.70	150.84	147.35	101.12	20.63
1,100.00	168.75	147.91	150.30	144.88	95.41	23.33
1,200.00	182.73	160.56	153.34	149.63	88.80	24.51
1,300.00	196.71	173.21	159.47	154.37	84.54	25.69
1,400.00	206.27	185.88	175.87	174.88	94.62	41.27
2,000.00	98.86	81.29	57.55	40.28	-21.77	-26.42
2,500.00	-98.63	-98.63	-98.63	-98.63	-98.63	-98.63
3,000.00	-108.49	-108.49	-108.49	-108.49	-108.49	-108.49
4,000.00	-118.36	-118.36	-118.36	-118.36	-118.36	-118.36
6,000.00	-128.22	-128.22	-128.22	-128.22	-128.22	-128.22

Initial Supporting table - RufCyl_Decel

Description: Used for P0300-P0308. Crankshaft decel threshold during Idle or GPF regen. 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 (%)

RufCyl_Decel - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	2,546	2,134	1,684	1,185	860	796	691	596	444	254	244	155	86
6	2,964	2,513	1,979	1,435	1,002	917	672	653	464	227	219	146	107
8	3,203	2,749	2,152	1,601	1,083	986	700	653	476	222	203	146	120
10	3,441	2,985	2,325	1,766	1,165	1,055	719	673	488	217	185	152	132
12	3,680	3,221	2,498	1,932	1,246	1,123	765	694	500	223	195	154	139
14	3,919	3,457	2,671	2,098	1,327	1,192	807	711	512	235	213	155	144
16	4,158	3,693	2,844	2,264	1,409	1,261	862	753	524	280	242	161	151
18	4,396	3,928	3,017	2,430	1,490	1,330	917	754	446	286	270	175	158
20	4,635	4,164	3,190	2,596	1,572	1,399	972	775	464	313	299	196	169
22	4,874	4,400	3,363	2,761	1,653	1,468	1,027	785	534	345	328	215	182
24	5,113	4,636	3,536	2,927	1,734	1,537	1,082	764	566	377	357	233	195
26	5,352	4,872	3,709	3,093	1,816	1,606	1,137	754	598	409	386	252	208
28	5,590	5,108	3,882	3,259	1,897	1,675	1,192	795	637	440	414	270	221
30	5,829	5,344	4,055	3,425	1,978	1,744	1,247	896	675	472	443	289	234
32	6,068	5,579	4,228	3,590	2,060	1,812	1,302	1,027	713	504	472	307	247
34	6,307	5,815	4,401	3,756	2,141	1,881	1,357	1,131	760	536	501	326	260
36	6,545	6,051	4,574	3,922	2,222	1,950	1,412	1,280	795	568	530	344	273

RufCyl_Decel - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	73	66	50	39	37	23	21	14	10	8	8	7	7
6	84	70	55	44	37	25	21	13	9	7	7	6	6
8	94	75	59	47	40	26	21	14	9	8	7	6	6
10	102	81	66	50	43	28	22	14	10	8	8	7	6
12	110	86	73	53	46	29	22	15	10	8	8	7	7
14	118	90	77	56	49	31	23	15	10	9	8	7	7
16	129	95	82	59	51	32	23	16	11	9	9	7	7
18	136	99	87	62	55	33	24	16	11	9	9	8	8
20	142	104	90	65	58	34	25	17	11	10	9	8	8
22	148	108	94	68	60	35	25	17	12	10	10	8	8
24	155	113	97	71	62	36	26	18	12	10	10	8	8

Initial Supporting table - RufCyl_Decel

26	161	117	100	74	64	37	26	19	12	11	10	9	9
28	167	121	103	77	66	38	27	19	13	11	11	9	9
30	174	126	107	80	68	39	27	19	13	11	11	9	9
32	180	130	110	83	70	40	28	20	13	12	11	10	10
34	186	135	113	85	72	41	28	20	14	12	12	10	10
36	193	139	116	88	73	42	29	21	14	12	12	10	10

Initial Supporting table - RufCyl_Jerk

Description: Crankshaft jerk threshold during Idle or GPF regen. 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 (%)

RufCyl_Jerk - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	4,536	2,995	2,004	1,117	724	510	466	420	350	260	134	111	95
6	4,933	3,516	2,522	1,672	1,206	817	628	536	432	255	170	136	117
8	5,195	3,821	2,844	2,029	1,608	1,045	721	580	493	250	185	151	131
10	5,458	4,126	3,166	2,385	1,994	1,321	813	669	543	256	204	166	148
12	5,720	4,431	3,488	2,742	2,364	1,579	906	758	574	263	210	181	165
14	5,983	4,735	3,810	3,098	2,750	1,854	998	847	597	261	221	195	181
16	6,246	5,040	4,132	3,455	3,146	2,130	1,091	936	568	275	234	210	187
18	6,508	5,345	4,454	3,812	3,495	2,415	1,183	1,025	544	300	241	228	187
20	6,771	5,649	4,777	4,168	3,844	2,643	1,276	1,113	572	331	269	250	194
22	7,033	5,954	5,099	4,525	4,193	2,872	1,369	1,202	615	361	298	272	224
24	7,296	6,259	5,421	4,881	4,542	3,101	1,461	1,291	685	392	327	294	251
26	7,558	6,564	5,743	5,238	4,892	3,330	1,554	1,380	755	423	355	316	265
28	7,821	6,868	6,065	5,595	5,241	3,558	1,822	1,469	825	454	384	338	279
30	8,084	7,173	6,387	5,951	5,590	3,787	1,905	1,557	895	485	413	359	293
32	8,346	7,478	6,709	6,308	5,939	4,016	1,989	1,646	965	516	441	381	307
34	8,609	7,783	7,032	6,664	6,289	4,244	2,072	1,735	1,035	547	470	403	321
36	8,871	8,087	7,354	7,016	6,638	4,473	2,156	1,774	1,105	578	499	425	335

RufCyl_Jerk - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	74	60	42	32	27	20	18	8	8	7	6	6	5
6	93	75	54	44	34	27	22	11	11	9	8	7	6
8	103	84	62	51	41	31	25	13	12	10	9	8	7
10	116	93	70	59	48	35	27	15	14	11	10	9	7
12	132	102	78	68	54	39	30	16	16	13	11	10	8
14	143	111	86	75	59	43	32	18	17	14	12	10	9
16	154	120	93	82	65	47	35	20	19	15	13	11	9
18	164	129	100	89	70	51	37	22	20	16	13	12	10
20	175	138	107	96	76	55	39	24	22	18	14	13	10
22	185	147	121	106	81	59	42	26	23	19	15	14	11
24	195	159	128	115	87	63	44	28	25	20	16	14	12

Initial Supporting table - RufCyl_Jerk

26	206	167	135	125	92	67	47	30	26	21	17	15	12
28	216	175	142	135	98	71	49	32	28	22	18	16	13
30	226	183	148	142	103	75	52	34	29	24	19	17	13
32	236	191	155	149	109	79	54	36	31	25	20	18	14
34	247	199	162	155	114	83	57	38	33	26	21	19	15
36	258	207	169	162	120	87	59	40	34	27	22	19	15

Initial Supporting table - RufSCD_Decel

Description: Used for P0300-P0308. Crankshaft decel threshold while in SCD mode during Idle or GPF regen. 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 (%)

RufSCD_Decel - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
28	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
32	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
34	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
36	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

RufSCD_Decel - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - RufSCD_Decel

22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
28	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
32	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
34	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
36	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - RufSCD_Jerk

Description: Used for P0300-P0308. Crankshaft jerk threshold while in SCD mode during Idle or GPF regen. 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 (%)

RufSCD_Jerk - Part 1

y/x	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
28	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
32	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
34	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
36	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

RufSCD_Jerk - Part 2

y/x	2,200	2,400	2,600	2,800	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
3	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
6	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
8	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
10	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
12	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
14	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
16	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
18	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
20	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
22	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - RufSCD_Jerk

24	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
26	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
28	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
30	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
32	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
34	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767
36	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767	32,767

Initial Supporting table - MisfireIMEP_Level

Description: Indicated Mean Effective Pressue estimate below which is considered misfire.   Threshold is a function of speed and load.

Value Units: kPa
X Unit: rpm
Y Units: Expected Load Indicated Mean Effective Pressure (kPa)

y/x	0	1	2	3	4	5	6	7	8
0	0	17	34	51	68	85	102	119	136
1	1	18	35	52	69	86	103	120	137
2	2	19	36	53	70	87	104	121	138
3	3	20	37	54	71	88	105	122	139
4	4	21	38	55	72	89	106	123	140
5	5	22	39	56	73	90	107	124	141
6	6	23	40	57	74	91	108	125	142
7	7	24	41	58	75	92	109	126	143
8	8	25	42	59	76	93	110	127	144
9	9	26	43	60	77	94	111	128	145
10	10	27	44	61	78	95	112	129	146
11	11	28	45	62	79	96	113	130	147
12	12	29	46	63	80	97	114	131	148
13	13	30	47	64	81	98	115	132	149
14	14	31	48	65	82	99	116	133	150
15	15	32	49	66	83	100	117	134	151
16	16	33	50	67	84	101	118	135	152

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	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Initial Supporting table - P0325_P0330_OpenCktThrshMax (20 kHz)

Description: Knock Open Circuit Diagnostic Maximum Threshold when using the 20 kHz method (see "OpenMethod" description)

Value Units: Unit-less, filtered term from the Knock Detection Fast Fourier Transform (FFT) for the 20 kHz frequency range.
X Unit: Engine Speed (RPM).
Y Units: N/A

y/x	750	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500
1	2.9434	3.0859	3.0859	3.0801	3.0391	2.9902	3.0410	2.9961	3.1777	3.1035	2.9277	2.9277	2.9277	2.9277	2.9277	2.9277	2.9277

Initial Supporting table - P0325_P0330_OpenCktThrshMax (Normal Noise)

Description: Knock Open Circuit Diagnostic Minimum Threshold when using the Normal Noise method (see "OpenMethod" description): When using the Normal Noise method (see "OpenMethod" description).

Value Units: Filtered background engine noise. Unit-less term from the Knock Detection Fast Fourier Transform (FFT) for a selected frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	2,700	2,900	3,000	3,250	3,500	3,750	4,000	4,250	4,500	4,750	5,000	5,500	6,000	6,500	7,000	7,500	8,500
1	0.2090	0.2090	0.2090	0.1836	0.1582	0.1504	0.1426	0.1387	0.1328	0.1250	0.1172	0.1172	0.1172	0.1172	0.1172	0.1172	0.1172

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	750	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	1.4355	1.5078	1.5117	1.5039	1.6660	1.6504	1.6719	1.6484	1.7578	1.7695	2.0293	2.0293	2.0293	2.0293	2.0293	2.0293	2.0293

Initial Supporting table - P0325_P0330_OpenCktThrshMin (Normal Noise)

Description: Knock Open Circuit Diagnostic Minimum Threshold when using the Normal Noise method (see "OpenMethod" description): When using the Normal Noise method (see "OpenMethod" description).

Value Units: Filtered background engine noise. Unit-less term from the Knock Detection Fast Fourier Transform (FFT) for a selected frequency range.
X Unit: Engine Speed (RPM)
Y Units: N/A

y/x	2,700	2,900	3,000	3,250	3,500	3,750	4,000	4,250	4,500	4,750	5,000	5,500	6,000	6,500	7,000	7,500	8,500
1	0.1094	0.1094	0.1094	0.0938	0.0781	0.0723	0.0664	0.0605	0.0566	0.0488	0.0410	0.0410	0.0410	0.0410	0.0410	0.0410	0.0410

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_NormalNoise

P0325_P0330_OpenMethod_2 - Part 3

y/x	10	11	12	13	14
1	CeKNKD_e_Open_NormalNoise	CeKNKD_e_Open_NormalNoise	CeKNKD_e_Open_NormalNoise	CeKNKD_e_Open_NormalNoise	CeKNKD_e_Open_NormalNoise

P0325_P0330_OpenMethod_2 - Part 4

y/x	15	16			
1	CeKNKD_e_Open_NormalNoise	CeKNKD_e_Open_NormalNoise			

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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

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	750	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	0.201	0.201	0.201	0.215	0.217	0.221	0.252	0.256	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371

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	750	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	0.100	0.100	0.102	0.105	0.104	0.111	0.123	0.127	0.178	0.178	0.178	0.178	0.178	0.178	0.178	0.178	0.178

Unique 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	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
800	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
1,200	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
1,600	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2,000	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2,400	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2,800	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3,200	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3,600	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
4,000	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
4,400	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
4,800	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
5,200	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
5,600	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
6,000	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
6,400	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
6,800	100.0	80.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Unique Supporting table - P04DB: Crankcase Pressure Noise Normalization for Engine Speed

Description: Value to normalize the Crankcase Pressure signal noise based on engine speed

Value Units: Scaling Factor for Noise (Unitless)
X Unit: Engine Speed (RPM)
Y Units: None

y/x	500	800	1,100	1,400	1,700	2,000	2,300	2,600	2,700
1	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

Unique Supporting table - P04DB: Crankcase Pressure Signal Normalization for Air Flow

Description: Value to normalize the Crankcase Pressure signal based on engine air flow

Value Units: Scaling Factor for Signal (Unitless)
X Unit: Engine Air Flow (Grams/Second)
Y Units: None

y/x	10	15	20	25	30	35	40	45	50
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
Transmission Control Module (TCM)	C1252	The longitudinal accleration sensor signal failed at a low voltge	hardware configuration	= CeLATR_e_VoltageDirectProp	transient delay timer	>=	30	Sec	>=	75	Sec	Special No MIL
			longitudinal accleration sensor raw signal	<= -3.849999905 g's					out of	120	Sec	
			hardware configuration	= CeLATR_e_VoltageDirectProp								
			longitudinal accleration sensor raw signal	>= -3.849999905 g's								
					longitudinal acceleration low voltage diagnostic enable calibration	=	1					
					Battery Voltage	<=	31.999023	Volts				
					Battery Voltage	>=	9	Volts				
					Battery voltage is within the allowable limits for	>=	0.1	Sec				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None						
Transmission Control Module (TCM)	C1253	The longitudinal accleration sensor signal failed at a high voltge	hardware configuration	= CeLATR_e_VoltageDirectProp	transient delay timer	>=	30	Sec	>=	75	Sec	Special No MIL
			longitudinal accleration sensor raw signal	>= 3.849999905 g's					out of	120	Sec	
			hardware configuration	= CeLATR_e_VoltageDirectProp								
			longitudinal accleration sensor raw signal	<= 3.849999905 g's								
					longitudinal acceleration high voltage diagnostic enable calibration	=	1					
					Battery Voltage	<=	31.999023	Volts				
					Battery Voltage	>=	9	Volts				
					Battery voltage is within the allowable limits for	>=	0.1	Sec				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None		
Transmission Control Module (TCM)	C1254	The longitudinal accleration signal is stuck at a high magnitude in range	absolute value (longitudinal accleration)	>= 0.529999971 g's	absolute value (longitudinal accleration) for stablity	>= 0.53 g's	>= 75 Sec	Special No MIL
			absolute value (longitudinal accleration)	<= 3.849999905 g's	absolute value (longitudinal accleration) for stablity	<= 3.8499999 g's	out of 120 Sec	
					stability time	>= 30 Sec		
					Diagnostic shifting override command	= FALSE Boolean		
					Attained Gear State	= 1st through 8th		
					Attained Gear Slip	<= 100 RPM		
					Transmission Type	= Clutch to Clutch Transmissi on		
					High Side Drivers enabled	= TRUE Boolean		
					transmssion output speed acceleration	>= 0.53 meter/second /second		
					Vehicle Speed	>= 15 kph		
					longitudinal acceleration stuck in range diagnostic enable calibration	= 1		
					Battery Voltage	<= 31.999023 Volts		
					Battery Voltage	>= 9 Volts		
					Battery voltage is within the allowable limits for	>= 0.1 Sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0721, P0722, P0723, P07BF, P07C0, P077B, P077C, P077D, P215C, U0073 ECM: None		
Transmission Control Module (TCM)	P0561	Battery to ignition voltage performance error at the TCM for an extended period of time.	delta = ABS(TCM battery voltage - TCM ignition voltage)	>= 3 Volts			= 40 Fail counts (100ms loop)	Type A, One Trip
							Out of 50 Sample Counts (100ms loop)	
					battery to ignition voltage performance diagnostic enable calibration	= 1		
					TCM has battery voltage circuit	= 1 Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	> 5 Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<= 2 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Transmission Control Module (TCM)	P0601	Transmission Electro-Hydraulic Control Module Read Only Memory	Incorrect program/calibrations checksum	= TRUE Boolean			>= 5 Fail Counts (background task continuous)	Type A, One Trip
					NVM write error diagnotic enable	= 1 Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0601 ECM: None		
Transmission Control Module (TCM)	P0603	Transmission Electro-Hydraulic Control Module Long-Term Memory Reset	Non-volatile memory (static or dynamic) checksum failure at controller initialization	= TRUE Boolean			Runs Continously	Type A, One Trip
					not programmed diagnotic enable	= 1 Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0603 ECM: None		
Transmission Control Module (TCM)	P0604	Transmission Electro-Hydraulic Control Module Random Access Memory	secondary micro processor RAM error	= TRUE Boolean			1000 ms cont.	Type A, One Trip
			OR					
			dual store RAM write time out error	= TRUE Boolean			> 175 seconds (interrupt driven based on calling functions)	
			OR					
			system RAM fault	= TRUE Boolean			>= 3 counts (controller initialization and background task continuous)	
			OR					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
			cashe RAM fault	=	TRUE	Boolean					>=	3	counts (controller initialization and background task continuous)	
			OR											
			secondary micro processor micro code error	=	TRUE	Boolean					>=	3	counts (controller initialization and background task continuous)	
			OR											
							Service mode $04 active or end of trip processing active	=	FALSE	Boolean				
			write attempt occurred during RAM lock	=	TRUE	Boolean					>	65534	counts (background task continuous)	
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None ECM: None						
Internal TCM Processor Integrity Fault	P0606	Transmission Electro-Hydraulic Control Module Processor Integrity	main processor RAM circuit hardware failure	=	TRUE	Boolean	RAM diagnotic test enable	=	1	Boolean	>=	5	counts (controller initialization)	Type A, One Trip
							hardware reset source is controller power up reset	=	TRUE	Boolean				
			OR											
			main processor flash EPROM circuit hardware failure	=	TRUE	Boolean	flash EPROM diagnotic test enable	=	1	Boolean	>=	5	counts (controller initialization)	
							hardware reset source is controller power up reset	=	TRUE	Boolean				
			OR											
			main processor memory stack failure	=	TRUE	Boolean	Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean	>=	5	counts (100 msec continuous)	
							main processor memory stack test enable	=	1	Boolean				
			OR											
			secondary processor memory stack failure	=	TRUE	Boolean	secondary processor memory stack test enable	=	1	Boolean	>=	5	counts (12.5 msec continuous)	
			OR											
			secondary micro processor remedial action active on request	=	FALSE	Boolean					>=	1	counts (controller power up, 12.5 ms continuous)	
			OR											
			main processor ROM first test complete	=	FALSE	Boolean					>=	35	counts (12.5 msec continuous)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
			OR											
			secondary processor to main processor seed sequence fault	=	TRUE	Boolean					>=	0.5	seconds	
			OR											
			seed sequence error	≠	FALSE	Boolean	program sequence watch communication fault	=	FALSE	Boolean	>=	3	counts (12.5 msec continuous)	
							main processor to secondary processor serial peripheral interface error	=	FALSE	Boolean	>=	17	counts (12.5 msec continuous)	
							seed sequence test enable	=	see table 50 in supporting documents	Boolean				
							battery voltage	>	11	Volts				
							ignition voltage	>=	11	volts				
			OR											
			seed key fault current loop	=	TRUE	Boolean	seed key test enable	=	see table 50 in supporting documents	Boolean				
							seed key fault previous loop	=	TRUE	Boolean				
							Service mode $04 active and end of trip processing active	=	FALSE	Boolean				
			OR											
			normalize 0-5 volt (absolute value (analog to digital test voltage commanded - actual analog to digital voltage feedback))	>	3.298950195	percent	analog to digital voltage test enabled	=	1	Boolean	>=	3	counts (50 msec continuous)	
							ignition voltage	>=	7	Volts	>=	8	counts (50 msec continuous)	
							analog to digital voltage channel enabled	=	see Table 46 in supporting documents	Boolean				
							analog to digital test voltage command	=	see Table 47 in supporting documents	Volts	>=	0.2	seconds	
							Service mode $04 active and end of trip processing active	=	FALSE	Boolean				
			OR											
			arithmatic logic unit 1 test pass	=	FALSE	Boolean	arithmatic logic unit test enable	=	1	Boolean		at controller initialization, then 12.5 ms cont.		
							arithmatic logic unit 1 test pass previous loop	=	FALSE	Boolean				
							Service mode $04 active and end of trip processing active	=	FALSE	Boolean				
							A and B and C must occur							

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
							A: starter motor engaged	=	TRUE	Boolean		
							B: ignition voltage	<=	11	Volts		
							C: starter motor engaged time	<	0.025	sec		
							A and B must occur					
							A: ignition voltage	<=	6.4091797	Volts		
							B: ignition low voltage time	>=	2.50E-02	sec		
			arithmatic logic unit 2 test pass	=	FALSE	Boolean	arithmatic logic unit test enable	=	1	Boolean	at controller initialization, then 12.5 ms cont.	
							arithmatic logic unit 1 test pass previous loop	=	FALSE	Boolean		
							Service mode $04 active and end of trip processing active	=	FALSE	Boolean		
							A and B and C must occur					
							A: starter motor engaged	=	TRUE	Boolean		
							B: ignition voltage	<=	11	Volts		
							C: starter motor engaged time	<	0.025	sec		
			OR									
			secondary processor arithmatic logic unit fault	=	TRUE	Boolean						
			OR									
			clock test fail current loop	=	TRUE	Boolean	clock test enable	=	1	Boolean	at controller initialization, then 12.5 ms cont.	
							clock test fail previous loop	=	TRUE	Boolean		
							Service mode $04 active and end of trip processing active	=	FALSE	Boolean		
							A and B and C must occur					
							A: starter motor engaged	=	TRUE	Boolean		
							B: ignition voltage	<=	11	Volts		
							C: starter motor engaged time	<	0.025	sec		
							A and B must occur					
							A: ignition voltage	<=	6.4091797	Volts		
							B: ignition low voltage time	>=	2.50E-02	sec		
			OR									
			configuration register test fail current loop	=	TRUE	Boolean	configuration register test enable	=	1	Boolean	at controller initialization, then 12.5 ms cont.	
							configuration register test fail previous loop	=	TRUE	Boolean		
							Service mode $04 active and end of trip processing active	=	FALSE	Boolean		
							A and B and C must occur					
							A: starter motor engaged	=	TRUE	Boolean		
							B: ignition voltage	<=	11	Volts		
							C: starter motor engaged time	<	0.025	sec		
							A and B must occur					
							A: ignition voltage	<=	6.4091797	Volts		
							B: ignition low voltage time	>=	2.50E-02	sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
			OR									
			secondary processor configuration register fault	=	TRUE	Boolean						
			OR									
			A or B occur									
			A: direct memeory access (DMA) read/write test result	≠	FALSE	Boolean	flash data transfer test enable	=	1	Boolean	normal controller initialization	
			B: direct memeory access (DMA) read/write value	≠	$5AA5A55A	hexadecimal value	flash data transfer test enable	=	1	Boolean	normal controller initialization	
			software uses DMA peripheral function to write and read $5AA5A55A to flash memory locations to verify each flash memory location				running reset	=	FALSE	Boolean		
							normal power up reset	=	TRUE	Boolean		
			OR									
			secondary micro processor detects main micor processor SPI fault	=	TRUE	Boolean						
			OR									
			A or B or C or D occur				seed and key store fault test enable	=	0	Boolean		
			A: last 6.25 msec seed and key time	>	see Table 48 in supporting documents	sec						
			B: last 12.5 msec seed and key time	>	see Table 48 in supporting documents	sec						
			C: last 50 msec seed and key time	>	see Table 48 in supporting documents	sec						
			D: last lores engine interrupt seed and key time	>	see Table 48 in supporting documents	sec						
			OR									
			A or B or C or D occur				prgram sequence watch test enable	=	see 3D_Table 1 in supporting documents	Boolean		
			A: 6.25 msec program sequence fault fail count	>=	see Table 49 in supporting documents	counts (50 msec continuous on 6.25 msec time interrupt)						
			B: 12.5 msec program sequence fault fail count	>=	see Table 49 in supporting documents	counts (50 msec continuous on 12.5 msec time interrupt)						
			C: 50 msec program sequence fault fail count	>=	see Table 49 in supporting documents	counts (50 msec continuous)						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
			D: engine lores interrupt program sequence fault fail count	>= see Table 49 in supporting documents counts (on execution of engine lores interrupts ECM only)				
					Service mode $04 active and end of trip processing active	= FALSE Boolean		
					secondary processor reports SPI communication fault previous loop	= TRUE Boolean		
					A and B and C must occur			
					A: starter motor engaged	= TRUE Boolean		
					B: ignition voltage	<= 11 Volts		
					C: starter motor engaged time	< 0.025 sec		
					SPI message checksum fault	≠ FASLE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Indicates that the TCM has detected an internal processor integrity fault	P062F	Transmission Electro-Hydraulic Control Module Long Term Memory Performance	TCM Non-Volatile Memory read or write error	= TRUE Boolean			every controller initialization	Type A, One Trip
					NVM write error diagnotic enable	= 1 Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P062F ECM: None		
High Side Driver 1	P0658	Actuator Supply Voltage Circuit Low	The HWIO reports a low voltage (ground short) error flag	= TRUE Boolean			>= 6 Fail Counts (6.25 msec continuous) out of 2395 Sample Counts (6.25 msec continuous)	Type A, One Trip
					actuator supply voltage circuit low enable calibration	= 1		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					P0658 Status is not	= Test Failed This Key On or Fault Active		
					P0658 Status is not	= Test Failed This Key On or Fault Active		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					High Side Driver 1 On	=	True	Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None				
						ECM: None				
Transmission Fluid Temperature Sensor (TFT)	P0711	transmission fluid temperature sensor rationality	Fail Case 1 transmission fluid temperature warm up test transmission fluid temperature raw	<= 15 ºC					>= see Table 26 in supporting documents seconds	Type B, Two Trips
					transmission fluid temperature sensor performance diagnsotic enable calibration	=	1	Boolean		
					P0712 and P0713	≠	Fault Active			
					Battery Voltage	<=	31.999023	Volts		
					Battery Voltage	>=	9	Volts		
					Battery voltage is within the allowable limits for	>=	0.1	Sec		
					Ignition Voltage	<=	31.999023	Volts		
					Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					transmission fluid temperature warm up test calibration enable	=	1	Boolean		
					driver accelerator pedal position valid	=	TRUE	Boolean		
					driver accelerator pedal position	>=	5	%		
					engine torque valid	=	TRUE	Boolean		
					engine torque steady state raw	>=	50	N*m		
					engine speed valid	=	TRUE	Boolean		
					engine speed	>=	500	RPM		
					P0722, P0723, P077C, P077D	≠	Fault Active			
					Vehicle Speed	>=	10	KPH		
					P2809 TCC stuck on fault fault status	≠	Test Failed This Key On or Fault Active			
					transmission fluid temperature	>=	-40	ºC		
					transmission fluid temperature	<=	150	ºC		
					engine coolant temperature valid	=	TRUE	Boolean		
					engine coolant temperature	>=	-40	ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					engine coolant temperature	<= 150 ºC		
			Fail Case 2 transmission fluid temperature intermittent delta temperature test transmission fluid temperature delta (100 ms loop to loop)	>= 10 ºC			>= 8 seconds (100 ms cont.)	
							>= 12 seconds (100 ms cont.)	
					transmission fluid temperature sensor performance diagnsotic enable calibration	= 1 Boolean		
					P0712 and P0713	≠ Fault Active		
					Battery Voltage	<= 31.999023 Volts		
					Battery Voltage	>= 9 Volts		
					Battery voltage is within the allowable limits for	>= 0.1 Sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					transmission fluid temperature intermittent delta temperature test calibration enable	= 1 Boolean		
					propulsion system active	= TRUE Boolean		
			Fail Case 3 transmission fluid temperature stuck in range test transmission fluid temperature delta (100 ms loop to loop)	<= 0 ºC			>= 300 seconds (100 ms cont.)	
					transmission fluid temperature sensor performance diagnsotic enable calibration	= 1 Boolean		
					P0712 and P0713	≠ Fault Active		
					Battery Voltage	<= 31.999023 Volts		
					Battery Voltage	>= 9 Volts		
					Battery voltage is within the allowable limits for	>= 0.1 Sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					transmission fluid temperature stuck in range test calibration enable	= 1 Boolean		
					propulsion system active	= TRUE Boolean		
					transmission fluid temperature	<= 150 ºC		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
					transmission fluid temperature	>=	-40	ºC				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0712, P0713, P0717, P0722, P0723, P077C, P077D, P02809 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E						
Transmission Fluid Temperature Sensor (TFT)	P0712	Transmission fluid temperature sensor failed at a low voltage	If Transmission Fluid Temperature Sensor Raw Resistance	<= 47.45000076 Ohms					>=	4	Fail Time (Sec)	Type B, Two Trips
									out of	5	Sample Time (Sec)	
					trans fluid temp sensor low voltage diagnostic enable	=	1	Boolean				
					Battery Voltage	<=	31.999023	Volts				
					Battery Voltage	>=	9	Volts				
					Battery voltage is within the allowable limits for	>=	0.1	Sec				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None						
Transmission Fluid Temperature Sensor (TFT)	P0713	Transmission fluid temperature sensor failed at a high voltage	If Transmission Fluid Temperature Sensor Raw Resistance	>= 105445 Ohms					>=	10	Fail Time (Sec)	Type B, Two Trips
									out of	12	Sample Time (Sec)	
					trans fluid temp sensor high voltage diagnostic enable	=	1	Boolean				
					Battery Voltage	<=	31.999023	Volts				
					Battery Voltage	>=	9	Volts				
					Battery voltage is within the allowable limits for	>=	0.1	Sec				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Transmission Input Speed Sensor (TISS)	P0716	Input Speed Sensor Performance	Abolute Value Of Transmission Input Speed Sensor Delta (loop to loop)	>= 850 RPM			>= 1.5 seconds >= 5 fail events	Type A, One Trip
					speed sensor processing	= time based		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					transmission input speed sensor performance diagnostic enable	= 1 Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	> 5 Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<= 2 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition Voltage Max (disabled above this value)	<= 31.999023 Volts		
					Ignition Voltage Min (enabled above this value)	>= 9 Volts		
					P0717 Status is not	= Test Failed This Key On		
					P07BF Status is not	= Test Failed This Key On		
					P07C0 Status is not	= Test Failed This Key On		
					last valid transmission input speed	> 148 RPM		
					OR			
					transmission input speed raw	>= 148 RPM		
					transmssion input speed last valid or raw timer	>= 2 Seconds		
					transmission input speed sensor performance test complete (initialized to FALSE set to TRUE when P0716 fails)	= FALSE Boolean		
					transmission hydraulic system pressurized	= TRUE Boolean		
					driver accelerator pedal position available	= TRUE Boolean		
					engine torque inaccurate	= FALSE Boolean		
					Transmission Output Speed Sensor Raw Speed	>= 230 RPM		
					driver accelerator pedal position	>= 5.0003052 Pct		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					engine actual torque steady state raw	<= 8191.875 N*m		
					engine actual torque steady state raw	>= 30 N*m		
					P0716 Status is not	= Test Failed This Key On or Fault Active		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P07BF, P07C0 ECM: P0101, P0102, P0103, P0121, P0122, P0123		
Transmission Input Speed Sensor (TISS)	P0717	Input Speed Sensor Circuit Low Voltage	Fail Case 1 Transmission Input Speed is OR	< 100 RPM			>= 4 Fail Time (Sec)	Type A, One Trip
			Fail Case 2 P0722 DTC Status is Test Failed This Key On and and controller uses single power feed Transmission Input Speed is	< 175 RPM				
					Controller uses a single power supply for the speed sensors	= 0 Boolean		
					speed sensor processing	= time based		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					transmission input speed sensor low diagnostic enable	= 1 Boolean		
					transmission hydraulic system pressurized	= TRUE Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	> 5 Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<= 2 Volts		
					speed sensor connected to controller	= 1 Boolean		
					P0722 Status is not	= fault active		
					P0723 Status is not	= fault active		
					P077C Status is not	= fault active		
					P077D Status is not	= fault active		
					brake pedal position is not	>= 69.999695 Pct		
					engine torque inaccurate	= FALSE Boolean		
					P0716 Status is not	= Test Failed This Key On		
					P07BF Status is not	= Test Failed This Key On		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					P07C0 Status is not	= Test Failed This Key On		
					driver accelerator pedal position	>= 5 Pct		
					engine actual torque steady state raw	<= 8191.875 N*m		
					engine actual torque steady state raw	>= 30 N*m		
					attained gear low	< CeCGSR_e_CR_Sixth		
					Transmission Output Speed Sensor Raw Speed when attained gear low	>= 72 RPM		
					attained gear high	>= CeCGSR_e_CR_Sixth		
					Transmission Output Speed Sensor Raw Speed when attained gear high	>= 230 RPM		
					P0717 Status is not	= Test Failed This Key On or Fault Active		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0722, P0723, P077C, P077D, P07BF, P07C0 ECM: P0101, P0102, P0103		
Transmission Output Speed Sensor (TOSS)	P0722	Output Speed Sensor Circuit Low Voltage	Transmission Output Speed Sensor Raw Speed	<= 30 RPM	attained gear high	> CeCGSR_e_CR_Fourth ENUM	>= 5 Fail Time (Sec)	Type A, One Trip
					attained gear low	<= CeCGSR_e_CR_Fourth ENUM	>= 3.5 Fail Time (Sec)	
					P0722 Status is not	= Test Failed This Key On or Fault Active		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					---------------------			
					transmission output speed sensor low diagnostic enable	= 1 Boolean		
					power flow not active (garage shift not complete, PRNDL = P or PRNDL = N, transmission range control in progress)	= TRUE Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					engine actual torque steady state raw power flow not active	>=	8192	N*m		
					driver accelerator position	>=	99.998474	Pct		
					----------------------					
					power flow not active (garage shift not complete, PRNDL = P or PRNDL = N, transmission range control in progress)	=	FALSE	Boolean		
					attained gear high	>	CeCGSR_ e_CR_Four th	ENUM		
					high gear engine actual torque steady state raw power flow active hysteresis high	>=	50	N*m		
					high gear engine actual torque steady state raw power flow active hysteresis low not	<=	30	N*m		
					high gear accelerator pedal position power flow active hysteresis high	>=	4.9987793	Pct		
					high gear accelerator pedal position power flow active hysteresis low not	<=	2.9998779	Pct		
					attained gear low	<=	CeCGSR_ e_CR_Four th	ENUM		
					low gear engine actual torque steady state raw power flow active hysteresis high	>=	80	N*m		
					low gear engine actual torque steady state raw power flow active hysteresis low not	<=	50	N*m		
					low gear accelerator pedal position power flow active hysteresis high	>=	7.9986572	Pct		
					low gear accelerator pedal position power flow active hysteresis low not	<=	4.9987793	Pct		
					----------------------					
					use transmission input speed sensor	=	TRUE	Boolean		
					speed sensors have single power feed	=	0	Boolean		
					transmission input speed sensor signal raw	<=	8191.875	RPM		
					transmission input speed sensor signal raw	>=	175	RPM		
					----------------------					
					use transmission input speed sensor	=	FALSE	Boolean		
					speed sensors have single power feed	=	0	Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					engine speed sensor signal	<= 8191.875 RPM		
					engine speed sensor signal	>= 3500 RPM		

					P0716 Status is not	= Fault Active		
					P0717 Status is not	= Fault Active		
					P07BF Status is not	= Fault Active		
					P07C0 Status is not	= Fault Active		
					PTO disable	= 1 Boolean		
					PTO engaged	= FALSE Boolean		
					driver accelerator pedal position available	= TRUE Boolean		
					engine torque inaccurate	= FALSE Boolean		
					transmission hydraulic system pressurized	= TRUE Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	> 5 Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<= 2 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition Voltage Max (disabled above this value)	<= 31.999023 Volts		
					Ignition Voltage Min (enabled above this value)	>= 9 Volts		
					transmssion fluid temperature sensor	>= -40 ºC		
					P0723 Status is not	= Test Failed This Key On		
					P077C Status is not	= Test Failed This Key On		
					P077D Status is not	= Test Failed This Key On		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0723 ECM: P0101, P0102, P0103, P0121, P0122, P0123		
Transmission Output Speed Sensor (TOSS)	P0723	Output Speed Sensor Circuit Intermittent	transmission output speed delta	>= see "set fail RPM threshold" RPM			>= 1.5 Fail Time (Sec)	Type A, One Trip
							>= 5 fail events	
					transmission output speed OR	>= 36 RPM		
					transmission output speed last valid output speed before drop	>= 36 RPM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					for TOSS output speed raw, TOSS last valid output speed, time	>=	2	seconds		
					set fail RPM threshold					
					4WD low state valid	=	TRUE	Boolean		
					4WD low state	=	TRUE	Boolean		
					2WD delta transmission output speed fail threshold	=	500	RPM		
					4WD gear ratio	=	2.71			
					final delta transmission output speed fail threshold	=	1355	RPM		
					OR					
					4WD low state valid	=	TRUE	Boolean		
					4WD low state	=	FALSE	Boolean		
					OR					
					4WD low state valid	=	FALSE	Boolean		
					2WD delta transmission output speed fail threshold	=	500	RPM		
					final delta transmission output speed fail threshold	=	500	RPM		

					Range_Disable	=	FALSE	See Below		
					OR					

					Neutral_Range_Enable	=	TRUE	See Below		
					And					
					Neutral_Speed_Enable	=	TRUE	See Below		
					are TRUE concurrently					

					Transmission_Range_Enable	=	TRUE	See Below		
					Transmission_Input_Speed_Enable	=	TRUE	See Below		
					transmission output speed sensor performance diagnostic enable	=	1	Boolean		
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean		
					No Change in Transfer Case Range (High <-> Low) for	>=	5	Seconds		
					P0723 Status is not	=	Test Failed This Key On or Fault Active			
					Disable this DTC if the PTO is active	=	1	Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	>	5	Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<=	2	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition Voltage Max (disabled above this value)	<=	31.999023	Volts		
					Ignition Voltage Min (enabled above this value)	>=	9	Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					P077C Status is not	= Test Failed This Key On		
					P077D Status is not	= Test Failed This Key On		
					Enable_Flags Defined Below			
					Transmission_Input_Speed_Enable is TRUE when either TIS Condition 1 or TIS Condition 2 is TRUE:			
					TIS Condition 1 is TRUE when both of the following conditions are satsified for	>= 2 Enable Time (Sec)		
					Input Speed Delta	<= 4095.875 RPM		
					Raw Input Speed	>= 148 RPM		
					TIS Condition 2 is TRUE when ALL of the next two conditions are satisfied			
					Input Speed	= 0 RPM		
					A Single Power Supply is used for all speed sensors	= TRUE Boolean		

					Neutral_Range_Enable is TRUE when any of the next 3 conditions are TRUE			
					Transmission Range is	= Neutral ENUM		
					Transmission Range is	= Reverse/Neutral Transitonal ENUM		
					Transmission Range is	= Neutral/Drive Transitional ENUM		
					KeTOSI_n_OutSpdInNeutNoiseMaxLim	< 50 RPM		
					and when Loop to Loop Drop of Transmission Output Speed is	> 500 RPM		

					Range_Disable is TRUE when any of the next three conditions are TRUE			
					Transmission Range is	= Park ENUM		
					Transmission Range is	= Park/Reverse Transitonal ENUM		
					Input Clutch is not	= ON (Fully Applied) ENUM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Neutral_Speed_Enable is TRUE when All of the next three conditions are satsified for	> 2 Seconds		
					Transmission Output Speed	>= 50 RPM		
					The loop to loop change of the Transmission Output Speed is	< 20 RPM		
					The loop to loop change of the Transmission Output Speed is	> -140 RPM		

					Transmission_Range_Enable is TRUE when one of the next six conditions is TRUE			
					Transmission Range is	= Neutral ENUM		
					Transmission Range is	= Reverse/Neutral Transitional ENUM		
					Transmission Range is	= Neutral/Drive Transitional ENUM		
					Time since a driven range (R,D) has been selected	>= see Table 21 in supporting documents Sec		
					Transmission Output Speed Sensor Raw Speed	>= 250 RPM		
					Output Speed when a fault was detected	>= 250 RPM		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P077C, P077D		
						ECM: P2771, P279A, P279B, P279C		
Variable Force Solenoid (VFS)	P0746	Pressure Control Solenoid A Stuck Off (clutch1/CB1278R)	absolute value (attained gear slip)	>= 400 RPM			>= 1.5 seconds	Type A, One Trip
							when fail time reaches fail limit increment fail event count	
							>= 3 event counts	
					clutch solenoid stuck on performance diagnostic monitor test deceleration limit not	= TRUE boolean		
					clutch solenoid stuck on performance diagnostic monitor test return to previous range not	= TRUE boolean		
					PRNDL State not	= park enumeration		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					PRNDL State not	=	neutral	enumeration		
					while conditinos A and B and C are met, time down delay from clibration to 0.0 seconds					
					delay time calibration	=	0.5	seconds		
					A) neutral condition fault pending	=	FALSE	boolean		
					B) intrusive shift active	=	FALSE	boolean		
					C) range shift state	=	shift complete	enumeration		
					intrusive shift allowed	=	TRUE	boolean		
					intrusive shift active	=	FALSE	boolean		
					steady state pressure adapt in progress	=	FALSE	boolean		
					transmission output speed	>=	100	RPM		
					accelerator pedal position	>=	0.5004883	%		
					accelerator pedal position valid	=	TRUE	Boolean		
					engine speed valid	=	TRUE	Boolean		
					D or E					
					D) select battery voltage to enable diagnsotic monitor	=	0	Boolean		
					E) battery voltage	<=	31.999023	volts		
					E) battery voltage	>=	9	volts		
					E) battery voltage time	>=	0.1	sec		
					F or G					
					F) select ignition voltage to enable diagnsotic monitor	=	0	Boolean		
					G) Ignition Voltage	<=	31.999023	Volts		
					G) Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					Hydraulic System Pressurized	=	TRUE	Boolean		
					high side driver 1 enabled	=	TRUE	Boolean		
					high side driver 2 enabled	=	TRUE	Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Variable Force Solenoid (VFS)	P0747	Pressure Control Solenoid A Stuck On (clutch1/CB1278R)	automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count deceleration limited	>= see Table 32 in supporting documents fail event counts				Type A, One Trip
			automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count no deceleration	>= see Table 33 in supporting documents fail event counts				
			A) absolute value (attained gear slip), fail during post torque phase of transmission automatic shift, before engine speed change, pull up or pull down occurs	<= 40 RPM				
			increment fail time when slip criteria met, fail time for power down shift				>= see Table 29 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift deceleration limited				>= see Table 30 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift no deceleration				>= see Table 31 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
			B) absolute value (command gear slip), fail during inertia phase of transmission automatic shift, engine speed change begins, pull up or pull down	>= 70 RPM				
			increment fail time when slip criteria met, fail time during shift deceleration limited				>= see Table 35 in supporting documents seconds	
			increment fail time when slip criteria met, fail time during shift no deceleration				>= see Table 36 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
					inertia phase test measured gear ratio	>= 0.558		
					inertia phase test measured gear ratio	<= 4.7150002		
					inertia phase test measured gear ratio time	>= 0.15 seconds		
					clutch test enabled	= see Table 10 in supporting documents boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					post torque phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 11 in supporting documents	N*m		
					post torque phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 12 in supporting documents	N*m		
					post torque phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 13 in supporting documents	N*m		
					post torque phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 14 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 15 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 16 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 17 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 18 in supporting documents	N*m		
					off going clutch pressure	<=	see Table 37 in supporting documents	kPa		
					off going clutch pressure closed throttle down shift delay time	>=	see Table 2 in supporting documents	seconds		
					off going clutch pressure closed power down shift delay time	>=	see Table 38 in supporting documents	seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					off going clutch pressure up shift delay time	>=	see Table 59 in supporting documents	seconds		
					on coming clutch pressure for up shift	>=	see Table 8 in supporting documents	kPa		
					on coming clutch pressure for down shift	>=	see Table 7 in supporting documents	kPa		
					brake pedal position hysteresis high disable	>=	27.000427	%		
					brake pedal position hysteresis low enable	<=	25	%		
					absolute value (attained gear slip)	<=	40	RPM		
					shift type enable	=	see Table 45 in supporting documents	boolean		
					clucth solenoid stuck off intrusive shift request not	=	TRUE	boolean		
					traction control event test suspend not	=	TRUE	boolean		
					transmission output speed	>=	100	RPM		
					accelerator pedal position valid	=	TRUE	Boolean		
					engine speed valid	=	TRUE	Boolean		
					D or E					
					D) select battery voltage to enable diagnsotic monitor	=	0	Boolean		
					E) battery voltage	<=	31.999023	volts		
					E) battery voltage	>=	9	volts		
					E) battery voltage time	>=	0.1	sec		
					F or G					
					F) select ignition voltage to enable diagnsotic monitor	=	0	Boolean		
					G) Ignition Voltage	<=	31.999023	Volts		
					G) Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					Hydraulic System Pressurized	=	TRUE	Boolean		
					high side driver 1 enabled	=	TRUE	Boolean		
					high side driver 2 enabled	=	TRUE	Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		
Variable Force Solenoid (VFS)	P0776	Pressure Control Solenoid B Stuck Off (clutch2/CB12345R)	absolute value (attained gear slip)	>= 400 RPM			>= 1.5 seconds when fail time reaches fail limit increment fail event count >= 3 event counts	Type A, One Trip
					clutch solenoid stuck on performance diagnostic monitor test deceleration limit not	= TRUE boolean		
					clutch solenoid stuck on performance diagnostic monitor test return to previous range not	= TRUE boolean		
					PRNDL State not	= park enumeration		
					PRNDL State not	= neutral enumeration		
					while conditinos A and B and C are met, time down delay from clibration to 0.0 seconds			
					delay time calibration	= 0.5 seconds		
					A) neutral condition fault pending	= FALSE boolean		
					B) intrusive shift active	= FALSE boolean		
					C) range shift state	= shift complete enumeration		
					intrusive shift allowed	= TRUE boolean		
					intrusive shift active	= FALSE boolean		
					steady state pressure adapt in progress	= FALSE boolean		
					transmission output speed	>= 100 RPM		
					accelerator pedal position	>= 0.5004883 %		
					accelerator pedal position valid	= TRUE Boolean		
					engine speed valid	= TRUE Boolean		
					D or E			
					D) select battery voltage to enable diagnsotic monitor	= 0 Boolean		
					E) battery voltage	<= 31.999023 volts		
					E) battery voltage	>= 9 volts		
					E) battery voltage time	>= 0.1 sec		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					F or G			
					F) select ignition voltage to enable diagnsotic monitor	= 0 Boolean		
					G) Ignition Voltage	<= 31.999023 Volts		
					G) Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Hydraulic System Pressurized	= TRUE Boolean		
					high side driver 1 enabled	= TRUE Boolean		
					high side driver 2 enabled	= TRUE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		
Variable Force Solenoid (VFS)	P0777	Pressure Control Solenoid B Stuck On (clutch2/CB12345R)	automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count deceleration limited	>= see Table 32 in supporting documents fail event counts				Type A, One Trip
			automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count no deceleration	>= see Table 33 in supporting documents fail event counts				
			A) absolute value (attained gear slip), fail during post torque phase of transmission automatic shift, before engine speed change, pull up or pull down occurs	<= 40 RPM				
			increment fail time when slip criteria met, fail time for power down shift				>= see Table 29 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift deceleration limited				>= see Table 30 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift no deceleration				>= see Table 31 in supporting documents seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
							when fail time reaches fail limit increment fail event count above	
			B) absolute value (command gear slip), fail during inertia phase of transmission automatic shift, engine speed change begins, pull up or pull down	>= 70 RPM				
			increment fail time when slip criteria met, fail time during shift deceleration limited				>= see Table 35 in supporting documents seconds	
			increment fail time when slip criteria met, fail time during shift no deceleration				>= see Table 36 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
					inertia phase test measured gear ratio	>= 0.558		
					inertia phase test measured gear ratio	<= 4.7150002		
					inertia phase test measured gear ratio time	>= 0.15 seconds		
					clutch test enabled	= see Table 10 in supporting documents boolean		
					post torque phase test engine torque hysteresis high enable for upshift or power on down shift	>= see Table 11 in supporting documents N*m		
					post torque phase test engine torque hysteresis low disable for upshift or power on down shift	> see Table 12 in supporting documents N*m		
					post torque phase test engine torque hysteresis high enable for closed throttle down shift	>= see Table 13 in supporting documents N*m		
					post torque phase test engine torque hysteresis low disable for closed throttle down shift	> see Table 14 in supporting documents N*m		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					inertia phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 15 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 16 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 17 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 18 in supporting documents	N*m		
					off going clutch pressure	<=	see Table 37 in supporting documents	kPa		
					off going clutch pressure closed throttle down shift delay time	>=	see Table 3 in supporting documents	seconds		
					off going clutch pressure closed power down shift delay time	>=	see Table 39 in supporting documents	seconds		
					off going clutch pressure up shift delay time	>=	see Table 60 in supporting documents	seconds		
					on coming clutch pressure for up shift	>=	see Table 8 in supporting documents	kPa		
					on coming clutch pressure for down shift	>=	see Table 7 in supporting documents	kPa		
					brake pedal position hysteresis high disable	>=	27.000427	%		
					brake pedal position hysteresis low enable	<=	25	%		
					absolute value (attained gear slip)	<=	40	RPM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					shift type enable	= see Table 45 in supporting documents boolean		
					clucth solenoid stuck off intrusive shift request not	= TRUE boolean		
					traction control event test suspend not	= TRUE boolean		
					transmission output speed	>= 100 RPM		
					accelerator pedal position valid	= TRUE Boolean		
					engine speed valid	= TRUE Boolean		
					D or E			
					D) select battery voltage to enable diagnsotic monitor	= 0 Boolean		
					E) battery voltage	<= 31.999023 volts		
					E) battery voltage	>= 9 volts		
					E) battery voltage time	>= 0.1 sec		
					F or G			
					F) select ignition voltage to enable diagnsotic monitor	= 0 Boolean		
					G) Ignition Voltage	<= 31.999023 Volts		
					G) Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Hydraulic System Pressurized	= TRUE Boolean		
					high side driver 1 enabled	= TRUE Boolean		
					high side driver 2 enabled	= TRUE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		
Transmission Output Speed Sensor (TOSS)	P077C	Output Speed Sensor Circuit Low	TOSS Analog Signal Voltage	<= 0.25 Volts			>= 5.00E-02 sec	Type A, One Trip
			P077C Status is not	= Test Failed This Key On or Fault Active				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
			If the above conditons have been met, increment the P077C Fail Counter											
			DTC P077C Sets when the Fail Counter	>=	16	Counts (6.25 msec continuous)								
							P077C Enable Calibration	=	1					
							Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean				
							Ignition Voltage Hyst Hi (enabled above this value)	>	5	Volts				
							Ignition Voltage Hyst Lo disabled below this value)	<=	2	Volts				
							Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
							Battery Voltage Max (disabled above this value)	<=	31.999023	Volts				
							Battery Voltage Min (disabled below this value)	<=	10	Volts				
							Ignition Voltage Min (disabled below this value)	>=	10	Volts				
							for voltage stablity time	>=	5	seconds				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: P077D						
Transmission Output Speed Sensor (TOSS)	P077D	Output Speed Sensor Circuit High	TOSS Analog Signal Voltage	>=	4.75	Volts					>=	5.00E-02	sec	Type A, One Trip
			P077D Status is not	=	Test Failed This Key On or Fault Active									
			If the above conditons have been met, increment the P077D Fail Counter											
			DTC P077D Sets when the Fail Counter	>=	16	Counts (12.5 msec continuous)								
							P077D Enable Calibration	=	1					
							Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean				
							Ignition Voltage Hyst Hi (enabled above this value)	>	5	Volts				
							Ignition Voltage Hyst Lo disabled below this value)	<=	2	Volts				
							Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
							Battery Voltage Max (disabled above this value)	<=	31.999023	Volts				
							Battery Voltage Min (disabled below this value)	<=	10	Volts				
							Ignition Voltage Min (disabled below this value)	>=	10	Volts				
							for voltage stablity time	>=	5	seconds				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P077C						
Variable Force Solenoid (VFS)	P0796	Pressure Control Solenoid C Stuck Off (clutch3/C13567)	absolute value (attained gear slip)	>= 400 RPM					>=	1.5	seconds	Type A, One Trip
											when fail time reaches fail limit increment fail event count	
									>=	3	event counts	
					clutch solenoid stuck on performance diagnostic monitor test deceleration limit not	=	TRUE	boolean				
					clutch solenoid stuck on performance diagnostic monitor test return to previous range not	=	TRUE	boolean				
					PRNDL State not	=	park	enumeration				
					PRNDL State not	=	neutral	enumeration				
					while conditinos A and B and C are met, time down delay from clibration to 0.0 seconds							
					delay time calibration	=	0.5	seconds				
					A) neutral condition fault pending	=	FALSE	boolean				
					B) intrusive shift active	=	FALSE	boolean				
					C) range shift state	=	shift complete	enumeration				
					intrusive shift allowed	=	TRUE	boolean				
					intrusive shift active	=	FALSE	boolean				
					steady state pressure adapt in progress	=	FALSE	boolean				
					transmission output speed	>=	100	RPM				
					accelerator pedal position	>=	0.5004883	%				
					accelerator pedal position valid	=	TRUE	Boolean				
					engine speed valid	=	TRUE	Boolean				
					D or E							
					D) select battery voltage to enable diagnsotic monitor	=	0	Boolean				
					E) battery voltage	<=	31.999023	volts				
					E) battery voltage	>=	9	volts				
					E) battery voltage time	>=	0.1	sec				
					F or G							
					F) select ignition voltage to enable diagnsotic monitor	=	0	Boolean				
					G) Ignition Voltage	<=	31.999023	Volts				
					G) Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
							Hydraulic System Pressurized	=	TRUE	Boolean				
							high side driver 1 enabled	=	TRUE	Boolean				
							high side driver 2 enabled	=	TRUE	Boolean				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E						
Variable Force Solenoid (VFS)	P0797	Pressure Control Solenoid C Stuck On (clutch3/C13567)	automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count deceleration limited	>=	see Table 32 in supporting documents	fail event counts								Type A, One Trip
			automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count no deceleration	>=	see Table 33 in supporting documents	fail event counts								
			A) absolute value (attained gear slip), fail during post torque phase of transmission automatic shift, before engine speed change, pull up or pull down occurs	<=	40	RPM								
			increment fail time when slip criteria met, fail time for power down shift								>=	see Table 29 in supporting documents	seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift deceleration limited								>=	see Table 30 in supporting documents	seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift no deceleration								>=	see Table 31 in supporting documents	seconds	
													when fail time reaches fail limit increment fail event count above	
			B) absolute value (command gear slip), fail during inertia phase of transmission automatic shift, engine speed change begins, pull up or pull down	>=	70	RPM								

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
			increment fail time when slip criteria met, fail time during shift deceleration limited						>=	see Table 35 in supporting documents	seconds	
			increment fail time when slip criteria met, fail time during shift no deceleration						>=	see Table 36 in supporting documents	seconds	
											when fail time reaches fail limit increment fail event count above	
					inertia phase test measured gear ratio	>=	0.558					
					inertia phase test measured gear ratio	<=	4.7150002					
					inertia phase test measured gear ratio time	>=	0.15	seconds				
					clutch test enabled	=	see Table 10 in supporting documents	boolean				
					post torque phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 11 in supporting documents	N*m				
					post torque phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 12 in supporting documents	N*m				
					post torque phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 13 in supporting documents	N*m				
					post torque phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 14 in supporting documents	N*m				
					inertia phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 15 in supporting documents	N*m				
					inertia phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 16 in supporting documents	N*m				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					inertia phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 17 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 18 in supporting documents	N*m		
					off going clutch pressure	<=	see Table 37 in supporting documents	kPa		
					off going clutch pressure closed throttle down shift delay time	>=	see Table 4 in supporting documents	seconds		
					off going clutch pressure closed power down shift delay time	>=	see Table 40 in supporting documents	seconds		
					off going clutch pressure up shift delay time	>=	see Table 61 in supporting documents	seconds		
					on coming clutch pressure for up shift	>=	see Table 8 in supporting documents	kPa		
					on coming clutch pressure for down shift	>=	see Table 7 in supporting documents	kPa		
					brake pedal position hysteresis high disable	>=	27.000427	%		
					brake pedal position hysteresis low enable	<=	25	%		
					absolute value (attained gear slip)	<=	40	RPM		
					shift type enable	=	see Table 45 in supporting documents	boolean		
					clucth solenoid stuck off intrusive shift request not	=	TRUE	boolean		
					traction control event test suspend not	=	TRUE	boolean		
					transmission output speed	>=	100	RPM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					accelerator pedal position valid	= TRUE Boolean		
					engine speed valid	= TRUE Boolean		
					D or E			
					D) select battery voltage to enable diagnsotic monitor	= 0 Boolean		
					E) battery voltage	<= 31.999023 volts		
					E) battery voltage	>= 9 volts		
					E) battery voltage time	>= 0.1 sec		
					F or G			
					F) select ignition voltage to enable diagnsotic monitor	= 0 Boolean		
					G) Ignition Voltage	<= 31.999023 Volts		
					G) Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Hydraulic System Pressurized	= TRUE Boolean		
					high side driver 1 enabled	= TRUE Boolean		
					high side driver 2 enabled	= TRUE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		
Transmission Input Speed Sensor (TISS)	P07BF	Input/Turbine Speed Sensor A Circuit Low	TISS Analog Signal Voltage	<= 0.25 Volts			>= 5.00E-02 sec	Type A, One Trip
			P07BF Status is not	= Test Failed This Key On or Fault Active				
			If the above conditons have been met, increment the P07BF Fail Counter					
			DTC P07BF Sets when the Fail Counter	>= 16 Counts (12.5 msec continuous)				
					speed sensor processing	= time based		
					P07BF Enable Calibration	= 1		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Ignition Voltage Hyst Hi (enabled above this value)	> 5 Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<= 2 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Battery Voltage Max (disabled above this value)	<= 31.999023 Volts		
					Battery Voltage Min (disabled below this value)	<= 10 Volts		
					Ignition Voltage Min (disabled below this value)	>= 10 Volts		
					for voltage stablity time	>= 5 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P07C0		
Transmission Input Speed Sensor (TISS)	P07C0	Input/Turbine Speed Sensor A Circuit High	TISS Analog Signal Voltage	>= 4.75 Volts			>= 5.00E-02 sec	Type A, One Trip
			P07C0 Status is not	= Test Failed This Key On or Fault Active				
			If the above conditons have been met, increment the P07C0 Fail Counter					
			DTC P07C0 Sets when the Fail Counter	>= 16 Counts (12.5 msec continuous)				
					speed sensor processing	= time based		
					P07C0 Enable Calibration	= 1		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	> 5 Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<= 2 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Battery Voltage Max (disabled above this value)	<= 31.999023 Volts		
					Battery Voltage Min (disabled below this value)	<= 10 Volts		
					Ignition Voltage Min (disabled below this value)	>= 10 Volts		
					for voltage stablity time	>= 5 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P07BF		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Tap Up Tap Down Switch (TUTD)	P0815	Upshift Switch Circuit	Fail Case 1 Tap Up Switch Stuck in the Up Position in Range 1 Enabled	= 1 Boolean				Special No MIL
			Tap Up Switch Stuck in the Up Position in Range 2 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 3 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 4 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 5 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 6 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 7 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 8 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Neutral Enabled	= 0 Boolean				
			Tap Up Switch Stuck in the Up Position in Park Enabled	= 0 Boolean				
			Tap Up Switch Stuck in the Up Position in Reverse Enabled	= 0 Boolean				
			Tap Up Switch ON	= TRUE Boolean			>= 1 Fail Time (Sec)	
			Fail Case 2 Tap Up Switch Stuck in the Up Position in Range 1 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 2 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 3 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 4 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 5 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 6 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 7 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Range 8 Enabled	= 1 Boolean				
			Tap Up Switch Stuck in the Up Position in Neutral Enabled	= 0 Boolean				
			Tap Up Switch Stuck in the Up Position in Park Enabled	= 0 Boolean				
			Tap Up Switch Stuck in the Up Position in Reverse Enabled	= 0 Boolean				
			Tap Up Switch ON	= TRUE Boolean				
			NOTE: Both Failcase1 and Failcase 2 Must Be Met				>= 120 Fail Time (Sec)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					upshift switch diagnostic monitor enable calibration	=	1			
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	>	5	Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<=	2	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition Voltage Max (disabled above this value)	<=	31.999023	Volts		
					Ignition Voltage Min (enabled above this value)	>=	9	Volts		
					Time Since Last Range Change	>=	1	Enable Time (Sec)		
					P0815 Status is	≠	Test Failed This Key On or Fault Active			
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0826, 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, P1761 ECM: None				
Tap Up Tap Down Switch (TUTD)	P0816	Downshift Switch Circuit	Fail Case 1 Tap Down Switch Stuck in the Down Position in Range 1 Enabled	= 1 Boolean						Special No MIL
			Tap Down Switch Stuck in the Down Position in Range 2 Enabled	= 1 Boolean						
			Tap Down Switch Stuck in the Down Position in Range 3 Enabled	= 1 Boolean						
			Tap Down Switch Stuck in the Down Position in Range 4 Enabled	= 1 Boolean						
			Tap Down Switch Stuck in the Down Position in Range 5 Enabled	= 1 Boolean						
			Tap Down Switch Stuck in the Down Position in Range 6 Enabled	= 1 Boolean						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
			Tap Down Switch Stuck in the Down Position in Range 7 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 8 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range Neutral Enabled	= 0 Boolean				
			Tap Down Switch Stuck in the Down Position in Range Park Enabled	= 0 Boolean				
			Tap Down Switch Stuck in the Down Position in Range Reverse Enabled	= 0 Boolean				
			Tap Down Switch ON	= TRUE Boolean			>= 1 sec	
			Fail Case 2 Tap Down Switch Stuck in the Down Position in Range 1 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 2 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 3 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 4 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 5 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 6 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 7 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Range 8 Enabled	= 1 Boolean				
			Tap Down Switch Stuck in the Down Position in Neutral Enabled	= 0 Boolean				
			Tap Down Switch Stuck in the Down Position in Park Enabled	= 0 Boolean				
			Tap Down Switch Stuck in the Down Position in Reverse Enabled	= 0 Boolean				
			Tap Down Switch ON	= TRUE Boolean				
			NOTE: Both Failcase1 and Failcase 2 Must Be Met				>= 120 sec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					downshift switch diagnostic monitor enable calibration	=	1			
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean		
					Ignition Voltage Hyst Hi (enabled above this value)	>	5	Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<=	2	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition Voltage Max (disabled above this value)	<=	31.999023	Volts		
					Ignition Voltage Min (enabled above this value)	>=	9	Volts		
					Time Since Last Range Change	>=	1	Enable Time (Sec)		
					P0816 Status is	≠	Test Failed This Key On or Fault Active			
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0826, 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, P1761 ECM: None				
Tap Up Tap Down Switch (TUTD)	P0826	Up and Down Shift Switch Circuit	TUTD Circuit Reads Invalid Voltage	= TRUE Boolean					>= 60 Fail Time (Sec)	Special No MIL
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean		
					upshift downshift switch circuit diagnostic monitor enable calibration	=	1			
					Ignition Voltage Hyst Hi (enabled above this value)	>	5	Volts		
					Ignition Voltage Hyst Lo disabled below this value)	<=	2	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition Voltage Max (disabled above this value)	<=	31.999023	Volts		
					Ignition Voltage Min (enabled above this value)	>=	9	Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					P0826 Status is	≠ Test Failed This Key On or Fault Active		
				Disable Conditions:	MIL not Illuminated for DTC's:			
Variable Force Solenoid (VFS)	P0960	Pressure Control Solenoid A Control Circuit Open (clutch1/CB1278R VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec)	Type A, One Trip
							out of 0.5 Sample Time (Sec)	
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e _HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P0962	Pressure Control Solenoid A Control Circuit Low (clutch1/CB1278R VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec)	Type A, One Trip
							out of 0.5 Sample Time (Sec)	
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e _HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P0963	Pressure Control Solenoid A Control Circuit High (clutch1/CB1278R VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P0964	Pressure Control Solenoid B Control Circuit Open (clutch2/CB12345R VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P0966	Pressure Control Solenoid B Control Circuit Low (clutch2/CB12345R VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P0967	Pressure Control Solenoid B Control Circuit High (clutch2/CB12345R VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
Variable Force Solenoid (VFS)	P0968	Pressure Control Solenoid C Control Circuit Open (clutch3/C13567 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e _HSD2	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				
							battery voltage in range for stability time							
							battery voltage stability time	>=	1	seconds				
							battery voltage	>=	8	volts				
							battery voltage	<=	32	Volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
Variable Force Solenoid (VFS)	P0970	Pressure Control Solenoid C Control Circuit Low (clutch3/C13567 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e _HSD2	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				
							battery voltage in range for stability time							
							battery voltage stability time	>=	1	seconds				
							battery voltage	>=	8	volts				
							battery voltage	<=	32	Volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
Variable Force Solenoid (VFS)	P0971	Pressure Control Solenoid C Control Circuit High (clutch3/C13567 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
							out of 0.5 Sample Time (Sec)	
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Transmission Control Module (TCM)	P16E9	Transmission Control Module	secondary micro processor hardware serial peripheral device fault active	= TRUE Boolean				Type A, One Trip
			secondary micro processor hardware serial peripheral device fault active previous loop	= TRUE Boolean				
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Transmission Control Module (TCM)	P16F0	Transmission Control Module	secondary micro processor serial peripheral device message valid detected by primary micro processor since controller initialization	= FALSE Boolean			>= 5 counts (12.5 ms) cont	Type A, One Trip
							>= 8 counts (12.5 ms) cont	
			OR					
			secondary micro processor serial peripheral device message valid detected by primary micro processor after controller initialization	= FALSE Boolean			>= 5 counts (12.5 ms) cont	
							>= 8 counts (12.5 ms) cont	
			OR					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
			secondary micro processor serial peripheral device message valid detected by primary micro processor after controller initialization	=	FALSE	Boolean					>=	5	counts (12.5 ms) NON continuous	
											>=	8	counts (12.5 ms) NON continuous	
							NOT in low voltage engine crank condition defined by A or B below during, for low voltage mode time							
							low voltage mode time	>=	2.50E-02	seconds				
							A) low voltage mode hysteresis time	<=	0.1	seconds				
							B) ignition voltage, set low voltage mode	<=	6.4091797	volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
Transmission Control Module (TCM)	P16F3	Transmission Control Module	diagnostic monitor fails when any of the following conditions occur A or B or C											Type A, One Trip
			A) command pressure and its dual store do not equal	=	TRUE	Boolean	redundent memory command pressure disable calibration not	=	TRUE	Boolean				
							OR							
							redundent memory command pressure enable calibration	=	TRUE	Boolean				
			OR											
			B) command shift and its dual store do not equal	=	TRUE	Boolean	redundent memory command shift disable calibration not	=	FALSE	Boolean				
							OR			Boolean				
							redundent memory command shift enable calibration	=	TRUE	Boolean				
			OR											
			C) rate limited vehicle speed and its dual store do not equal	=	TRUE	Boolean	rate limited vehicle speed dual store enable calibration	=	TRUE	Boolean	>=	10	counts (25 msec continuous)	
											>=	20	counts (25 msec continuous)	
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Transmission Control Module (TCM)	P16F4	Transmission Control Module	redundent path calculation of driver selected transmission range error	= TRUE Boolean			>= 6 counts (25 msec continuous)	Type A, One Trip
							>= 8 counts (25 msec continuous)	
					secureed controller or emission critical ignition voltage	>= 11 volts		
					P16F4 status is not	= test pass this key on Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None		
						ECM: None		
Transmission Control Module (TCM)	P16FB	Transmission Control Module	transmission output speed raw (25 ms loop value) - transmission output speed raw (6.25 ms loop value)	>= 60 RPM			>= 8 seconds	Type A, One Trip
							>= 10 seconds	
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Battery Voltage Max (disabled above this value)	<= 31.999023 Volts		
					Battery Voltage Min (disabled below this value)	<= 10 Volts		
					Ignition Voltage Min (disabled below this value)	>= 10 Volts		
					for voltage stablity time	>= 5 seconds		
					transmission output speed raw (6.25 ms loop value)	>= 150 RPM		
					transmission output speed raw (25 ms loop value)	>= 150 RPM		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					diagnostic monitor enable calibration	= 1 Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None		
						ECM: None		
Lateral acceleration signal	P175F	Lateral acceleration signal circuit (rolling count or checksum)	P175F will fail when A: message alive rolling count erroror or B: message checksum error					Special No MIL
			A: Rolling count value received from EBCM and expected TCM calculated value not	= TRUE Boolean			>= 9 Fail Counter (50 msec continuous)	
							> 54 Fail Timer (Sec)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
					Lateral acceleration message health (message receive occur)	=	TRUE	Boolean				
					Lateral acceleration signal circuit rolling count diagnostic monitor enable calibration	=	1	Boolean				
					battery voltage	<=	31.999023	volts				
					battery voltage	>=	9	volts				
					battery voltage time	>=	0.1	sec				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				
			B: checksum of lateral acceleration message value error	= TRUE Boolean					>=	54	Fail Timer (Sec)	
					Lateral acceleration message health (message receive occur)	=	TRUE	Boolean				
					Lateral acceleration signal circuit checksum diagnostic monitor enable calibration	=	1	Boolean				
					battery voltage	<=	31.999023	volts				
					battery voltage	>=	9	volts				
					battery voltage time	>=	0.1	sec				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				
					Ignition voltage and SFL conditions met for	>=	0.1	Sec				
					normal serial data communication enabled	=	TRUE	Boolean				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None						
Tap Up Tap Down Switch (TUTD)	P1761	Tap Up and Down switch signal circuit (rolling count)	Rolling count value received from BCM and expected TCM calculated value not	= TRUE Boolean					>=	3	Fail Counter (100 msec continuous)	Special No MIL
									>	10	Fail Timer (Sec)	
					Tap up/down message health (message receive occur)	=	TRUE	Boolean				
					Tap up/downswitch signal circuit (rolling count) diagnostic monitor enable calibration	=	1	Boolean				
					Ignition Voltage	<=	31.999023	Volts				
					Ignition Voltage	>=	9	Volts				
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:					
Transmission Intermediate Speed Sensor	P176B	Transmission Intermediate Speed Sensor Performance	attained gear is Reverse or 1st or 2nd		fail time	>=	4	seconds	>= 4 counts (25 msec continuous)	Type B, Two Trips
			transmssion intermediate speed	> 60 PRM						
			attained gear is 3rd or 4th or 5th or 6th or 7th or 8th							
			calculated intermediate gear slip = absolute value (transmission input speed - (transmission intermediate speed * command gear intermediate ratio))	> 60 PRM						
					calculated gear slip = absolute value (transmission input speed - (transmission output speed * command gear ratio))	<=	60	RPM		
					calculated gear slip stablity time when all of the conditions below are met	>=	1	seconds		
					diagnostic monitor enable calibration	=	1	Boolean		
					transmission output speed	>=	190	RPM		
					transmission input speed	>=	395	RPM		
					neutral idle mode requesting holding clutch disable	=	FALSE	Boolean		
					range shift state is	=	shift complete			
					Hydraulic System Pressurized	=	TRUE	Boolean		
					battery voltage	<=	31.999023	volts		
					battery voltage	>=	9	volts		
					battery voltage time	>=	0.1	sec		
					Ignition Voltage	<=	31.999023	Volts		
					Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P07BF, P07C0, P0722, P0723, P077C, P077D				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required		Mil Illum.
Transmission Intermediate Speed Sensor	P176C	Intermediate Speed Sensor Circuit Low	speed sensor1 voltage	<= see Table 51 in supporting documents volts	speed sensor1 fail time	>=	see Table 53 in supporting documents	seconds	>= see Table 52 in supporting documents	counts (12.5 msec continuous)	Type B, Two Trips
					speed sensor1 circuit low diagnostic monitor enable calibration	=	see Table 54 in supporting documents	Boolean			
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean			
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean			
					Battery Voltage Max (disabled above this value)	<=	31.999023	Volts			
					Battery Voltage Min (disabled below this value)	<=	10	Volts			
					Ignition Voltage Min (disabled below this value)	>=	10	Volts			
					for voltage stablity time	>=	5	seconds			
					P176C Status is not	=	Test Failed This Key On or Fault Active				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P176D					
Transmission Intermediate Speed Sensor	P176D	Intermediate Speed Sensor Circuit High	speed sensor1 voltage	>= see Table 55 in supporting documents volts	speed sensor1 fail time	>=	see Table 57 in supporting documents	seconds	>= see Table 56 in supporting documents	counts (12.5 msec continuous)	Type B, Two Trips
					speed sensor1 circuit high diagnostic monitor enable calibration	=	see Table 58 in supporting documents	Boolean			
					Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean			
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean			
					Battery Voltage Max (disabled above this value)	<=	31.999023	Volts			
					Battery Voltage Min (disabled below this value)	<=	10	Volts			
					Ignition Voltage Min (disabled below this value)	>=	10	Volts			
					for voltage stablity time	>=	5	seconds			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					P176D Status is not	= Test Failed This Key On or Fault Active		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P176C		
Internal Mode Switch (IMS)	P1824	Internal Mode Switch P Circuit High Voltage	IMS switch P voltage	> 2.380000114 volts			>= 70 Fail Counts (25ms loop)	Type B, Two Trips
							out of 80 Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P182A	Internal Mode Switch A Circuit Low Voltage	IMS switch A voltage	< 0.699999988 volts			>= 70 Fail Counts (25ms loop)	Type B, Two Trips
							out of 80 Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P182B	Internal Mode Switch B Circuit Low Voltage	IMS switch B voltage	< 0.699999988 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P182C	Internal Mode Switch B Circuit High Voltage	IMS switch B voltage	> 2.380000114 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P182D	Internal Mode Switch P Circuit Low Voltage	IMS switch P voltage	< 0.699999988 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P182E	Internal Mode Switch Illegal Range	Range	= Illegal (SABCP= 00000 or SABCP= 10000) enumeration			>= 108 Fail Counts (25ms loop) out of 125 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P182F	Internal Mode Switch C Circuit High Voltage	IMS switch C voltage	> 2.380000114 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P1838	Internal Mode Switch A Circuit High Voltage	IMS switch A voltage	> 2.380000114 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Internal Mode Switch (IMS)	P1839	Internal Mode Switch C Circuit Low Voltage	IMS switch C voltage	< 0.699999988 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P1840	Internal Mode Switch S Circuit Low Voltage	IMS switch S voltage	< 0.699999988 volts			>= 70 Fail Counts (25ms loop) out of 80 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P1841	Internal Mode Switch S Circuit High Voltage	IMS switch S voltage	> 2.380000114 volts			>= 70 Fail Counts (25ms loop)	Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
							out of 80 Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18B5	Internal Mode Switch A Circuit Shorted	IMS switch A voltage	< 1.679999948 volts			>= 70 Fail Counts (25ms loop)	Type B, Two Trips
			IMS switch A voltage	> 0.966000021 volts			out of 80 Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18B6	Internal Mode Switch B Circuit Shorted	IMS switch B voltage	< 1.679999948 volts			>= 70 Fail Counts (25ms loop)	Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions				Time Required			Mil Illum.
			IMS switch B voltage	> 0.966000021 volts						out of	80	Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	=	1	Boolean					
					Ignition Voltage Lo	>=	9	Volts					
					Ignition Voltage Hi	<=	31.999023	Volts					
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event								
					Ignition Voltage Lo	>=	7	Volts					
					Ignition Voltage Hi	<	9	Volts					
					Ignition Voltage within the above low / high thresholds for	<=	7.50E-02	seconds					
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None							
Internal Mode Switch (IMS)	P18B7	Internal Mode Switch C Circuit Shorted	IMS switch C voltage	< 1.679999948 volts						>=	70	Fail Counts (25ms loop)	Type B, Two Trips
			IMS switch C voltage	> 0.966000021 volts						out of	80	Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	=	1	Boolean					
					Ignition Voltage Lo	>=	9	Volts					
					Ignition Voltage Hi	<=	31.999023	Volts					
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event								
					Ignition Voltage Lo	>=	7	Volts					
					Ignition Voltage Hi	<	9	Volts					
					Ignition Voltage within the above low / high thresholds for	<=	7.50E-02	seconds					
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None							
Internal Mode Switch (IMS)	P18B8	Internal Mode Switch P Circuit Shorted	IMS switch P voltage	< 1.679999948 volts						>=	70	Fail Counts (25ms loop)	Type B, Two Trips
			IMS switch P voltage	> 0.966000021 volts						out of	80	Sample Counts (25ms loop)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
					Diagnostic monitor enable calibration	=	1	Boolean				
					Ignition Voltage Lo	>=	9	Volts				
					Ignition Voltage Hi	<=	31.999023	Volts				
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event							
					Ignition Voltage Lo	>=	7	Volts				
					Ignition Voltage Hi	<	9	Volts				
					Ignition Voltage within the above low / high thresholds for	<=	7.50E-02	seconds				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None						
						ECM: None						
Internal Mode Switch (IMS)	P18B9	Internal Mode Switch S Circuit Shorted	IMS switch S voltage	< 1.679999948 volts					>=	70	Fail Counts (25ms loop)	Type B, Two Trips
			IMS switch S voltage	> 0.966000021 volts					out of	80	Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	=	1	Boolean				
					Ignition Voltage Lo	>=	9	Volts				
					Ignition Voltage Hi	<=	31.999023	Volts				
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event							
					Ignition Voltage Lo	>=	7	Volts				
					Ignition Voltage Hi	<	9	Volts				
					Ignition Voltage within the above low / high thresholds for	<=	7.50E-02	seconds				
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None						
						ECM: None						
Internal Mode Switch (IMS)	P18BA	Internal Mode Switch A Stuck Off	Range	= Transition 30 (SABCP= 00001) enumeration					>=	108	Fail Counts (25ms loop)	Type B, Two Trips
			Switch A	≠ True (this key cycle) boolean					out of	125	Sample Counts (25ms loop)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18BB	Internal Mode Switch B Stuck Off	Range	= Transition 29 (SABCP= 00010) enumeration			>= 108 Fail Counts (25ms loop)	Type B, Two Trips
			Prev Range	= Transition 14 (SABCP= 10001)			out of 125 Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18BC	Internal Mode Switch C Stuck Off	Range	= Transition 27 (SABCP= 00100) enumeration			>= 108 Fail Counts (25ms loop)	Type B, Two Trips
							out of 125 Sample Counts (25ms loop)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Diagnostic monitor enable calibration Ignition Voltage Lo Ignition Voltage Hi If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event Ignition Voltage Lo Ignition Voltage Hi Ignition Voltage within the above low / high thresholds for	= 1 Boolean >= 9 Volts <= 31.999023 Volts >= 7 Volts < 9 Volts <= 7.50E-02 seconds		
			Disable Conditions:		MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18BD	Internal Mode Switch P Stuck Off	Range Prev Range	= Transition 23 (SABCP= 01000) enumeration = Transition 11 (SABCP= 10100)			>= 108 Fail Counts (25ms loop) out of 125 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration Ignition Voltage Lo Ignition Voltage Hi If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event Ignition Voltage Lo Ignition Voltage Hi Ignition Voltage within the above low / high thresholds for	= 1 Boolean >= 9 Volts <= 31.999023 Volts >= 7 Volts < 9 Volts <= 7.50E-02 seconds		
			Disable Conditions:		MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18BE	Internal Mode Switch S Stuck Off	Range Prev Range	= Drive 8 enumeration = Transition 26 (SABCP= 00101)			>= 108 Fail Counts (25ms loop) out of 125 Sample Counts (25ms loop)	Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
			Switch A	= True (this key cycle) boolean				
			Switch S	≠ True (this key cycle) boolean				
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18C0	Internal Mode Switch B Stuck On	Range	= Drive 8 enumeration			>= 108 Fail Counts (25ms loop)	Type B, Two Trips
			Prev Range = Park for	>= 80 counts (25ms loop)			out of 125 Sample Counts (25ms loop)	
			Switch B	≠ False (this key cycle) boolean				
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18C1	Internal Mode Switch C Stuck On	Range	= Transition 20 (SABCP= 01011) enumeration			>= 108 Fail Counts (25ms loop)	Type B, Two Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
			Switch C	≠ False (this key cycle) boolean			out of 125 Sample Counts (25ms loop)	
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18C2	Internal Mode Switch P Stuck On	Range	= Transition 24 (SABCP= 00111) enumeration			>= 108 Fail Counts (25ms loop) out of 125 Sample Counts (25ms loop)	Type B, Two Trips
					Diagnostic monitor enable calibration	= 1 Boolean		
					Ignition Voltage Lo	>= 9 Volts		
					Ignition Voltage Hi	<= 31.999023 Volts		
					If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event			
					Ignition Voltage Lo	>= 7 Volts		
					Ignition Voltage Hi	< 9 Volts		
					Ignition Voltage within the above low / high thresholds for	<= 7.50E-02 seconds		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Internal Mode Switch (IMS)	P18C3	Internal Mode Switch S Stuck On	Range	= Drive 7 enumeration			>= 108 Fail Counts (25ms loop)	Type B, Two Trips
			Prev Range = Park for	>= 80 counts (25ms loop)			out of 125 Sample Counts (25ms loop)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
			Switch S	≠	False (this key cycle)	boolean								
							Diagnostic monitor enable calibration	=	1	Boolean				
							Ignition Voltage Lo	>=	9	Volts				
							Ignition Voltage Hi	<=	31.999023	Volts				
							If ignition voltage was previously between the above low / high thresholds, then the following conditions apply once per auto start event							
							Ignition Voltage Lo	>=	7	Volts				
							Ignition Voltage Hi	<	9	Volts				
							Ignition Voltage within the above low / high thresholds for	<=	7.50E-02	seconds				
						Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None						
Internal Mode Switch (IMS)	P1915	Internal Mode Switch Does Not Indicate Park/Neutral (P/N) During Start	Range	≠	Park Neutral Transition 1 (SABCP= 11110) Transition 2 (SABCP= 11101) Transition 4 (SABCP= 11011) Transition 17 (SABCP= 01110) Transition 18 (SABCP= 01101) Transition 21 (SABCP= 01010)	Enumeration								Type B, Two Trips
			The following events must occur Sequentially											
			Initial Engine speed	<=	50	RPM					>=	0.1	Enable Time (Sec)	
			Then Engine Speed Between Following Cals											
			Engine Speed Lo Hist	>=	50	RPM								
			Engine Speed Hi Hist	<=	480	RPM					>=	0.06875	Enable Time (Sec)	
			Then Final Engine Speed	>=	550	RPM								
			Final Transmission Input Speed	>=	100	RPM					>=	1.25	Fail Time (Sec)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					DTC has Ran this Key Cycle	= FALSE Boolean		
					Ignition Voltage Lo	>= 6 V		
					Ignition Voltage Hi	<= 31.900391 V		
					Ignition Voltage Hyst High (enables above this value)	>= 5 V		
					Ignition Voltage Hyst Low (disabled below this value)	<= 2 V		
					Transmission Output Speed	<= 90 rpm		
					P1915 Status is	≠ Test Failed This Key On or Fault Active		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0722, P0723 ECM: None		
Transmission Control Module (TCM)	P2534	Ignition Switch Run/Start Position Circuit Low	TCM Run crank active (based on voltage thresholds below)	= FALSE Boolean				Type A, One Trip
			Ignition Voltage High Hyst (run crank goes true when above this value)	> 5 Volts			>= 280 one fail count per 25 ms loop	
			Ignition Voltage Low Hyst (run crank goes false when below this value)	< 2 Volts			Out of 280 one sample count per 25 ms loop	
					Ignition Switch Run/Start Position Circuit Low diagnaotic enable calibration	= 1 Boolean		
					ECM run/crank active status available from serial data	= TRUE Boolean		
					ECM run/crank active status	= TRUE Boolean		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Transmission Control Module (TCM)	P2535	Ignition Switch Run/Start Position Circuit High	TCM Run crank active (based on voltage thresholds below)	= TRUE Boolean				Type A, One Trip
			Ignition Voltage High Hyst (run crank goes true when above this value)	> 5 Volts			>= 280 one fail count per 25 ms loop	
			Ignition Voltage Low Hyst (run crank goes false when below this value)	< 2 Volts			Out of 280 one sample count per 25 ms loop	
					Ignition Switch Run/Start Position Circuit High diagnaotic enable calibration	= 1 Boolean		
					ECM run/crank active status available from serial data	= TRUE Boolean		
					ECM run/crank active status	= FALSE Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
High Side Driver 2	P2670	Actuator Supply Voltage B Circuit Low	The HWIO reports a low voltage (ground short) error flag	= TRUE Boolean			>= 6 Fail Counts (6.25 msec continuous) out of 2395 Sample Counts (6.25 msec continuous)	Type A, One Trip
					actuator supply voltage circuit low enable calibration	= 1		
					Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					P2670 Status is not	= Test Failed This Key On or Fault Active		
					P2670 Status is not	= Test Failed This Key On or Fault Active		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					High Side Driver 2 On	= True Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2714	Pressure Control Solenoid D Stuck Off (clutch4/C23468)	absolute value (attained gear slip)	>= 400 RPM			>= 1.5 seconds when fail time reaches fail limit increment fail event count >= 3 event counts	Type A, One Trip
					clutch solenoid stuck on performance diagnostic monitor test deceleration limit not	= TRUE boolean		
					clutch solenoid stuck on performance diagnostic monitor test return to previous range not	= TRUE boolean		
					PRNDL State not	= park enumeration		
					PRNDL State not	= neutral enumeration		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					while conditinos A and B and C are met, time down delay from clibration to 0.0 seconds			
					delay time calibration	= 0.5 seconds		
					A) neutral condition fault pending	= FALSE boolean		
					B) intrusive shift active	= FALSE boolean		
					C) range shift state	= shift complete enumeration		
					intrusive shift allowed	= TRUE boolean		
					intrusive shift active	= FALSE boolean		
					steady state pressure adapt in progress	= FALSE boolean		
					transmission output speed	>= 100 RPM		
					accelerator pedal position	>= 0.5004883 %		
					accelerator pedal position valid	= TRUE Boolean		
					engine speed valid	= TRUE Boolean		
					D or E			
					D) select battery voltage to enable diagnsotic monitor	= 0 Boolean		
					E) battery voltage	<= 31.999023 volts		
					E) battery voltage	>= 9 volts		
					E) battery voltage time	>= 0.1 sec		
					F or G			
					F) select ignition voltage to enable diagnsotic monitor	= 0 Boolean		
					G) Ignition Voltage	<= 31.999023 Volts		
					G) Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Hydraulic System Pressurized	= TRUE Boolean		
					high side driver 1 enabled	= TRUE Boolean		
					high side driver 2 enabled	= TRUE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Variable Force Solenoid (VFS)	P2715	Pressure Control Solenoid D Stuck On (clutch4/C23468)	automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count deceleration limited	>= see Table 32 in supporting documents fail event counts				Type A, One Trip
			automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count no deceleration	>= see Table 33 in supporting documents fail event counts				
			A) absolute value (attained gear slip), fail during post torque phase of transmission automatic shift, before engine speed change, pull up or pull down occurs	<= 40 RPM				
			increment fail time when slip criteria met, fail time for power down shift				>= see Table 29 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift deceleration limited				>= see Table 30 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift no deceleration				>= see Table 31 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
			B) absolute value (command gear slip), fail during inertia phase of transmission automatic shift, engine speed change begins, pull up or pull down	>= 70 RPM				
			increment fail time when slip criteria met, fail time during shift deceleration limited				>= see Table 35 in supporting documents seconds	
			increment fail time when slip criteria met, fail time during shift no deceleration				>= see Table 36 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
					inertia phase test measured gear ratio	>= 0.558		
					inertia phase test measured gear ratio	<= 4.7150002		
					inertia phase test measured gear ratio time	>= 0.15 seconds		
					clutch test enabled	= see Table 10 in supporting documents boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					post torque phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 11 in supporting documents	N*m		
					post torque phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 12 in supporting documents	N*m		
					post torque phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 13 in supporting documents	N*m		
					post torque phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 14 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 15 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 16 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 17 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 18 in supporting documents	N*m		
					off going clutch pressure	<=	see Table 37 in supporting documents	kPa		
					off going clutch pressure closed throttle down shift delay time	>=	see Table 5 in supporting documents	seconds		
					off going clutch pressure closed power down shift delay time	>=	see Table 41 in supporting documents	seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					off going clutch pressure up shift delay time	>=	see Table 62 in supporting documents	seconds		
					on coming clutch pressure for up shift	>=	see Table 8 in supporting documents	kPa		
					on coming clutch pressure for down shift	>=	see Table 7 in supporting documents	kPa		
					brake pedal position hysteresis high disable	>=	27.000427	%		
					brake pedal position hysteresis low enable	<=	25	%		
					absolute value (attained gear slip)	<=	40	RPM		
					shift type enable	=	see Table 45 in supporting documents	boolean		
					clucth solenoid stuck off intrusive shift request not	=	TRUE	boolean		
					traction control event test suspend not	=	TRUE	boolean		
					transmission output speed	>=	100	RPM		
					accelerator pedal position valid	=	TRUE	Boolean		
					engine speed valid	=	TRUE	Boolean		
					D or E					
					D) select battery voltage to enable diagnsotic monitor	=	0	Boolean		
					E) battery voltage	<=	31.999023	volts		
					E) battery voltage	>=	9	volts		
					E) battery voltage time	>=	0.1	sec		
					F or G					
					F) select ignition voltage to enable diagnsotic monitor	=	0	Boolean		
					G) Ignition Voltage	<=	31.999023	Volts		
					G) Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					Hydraulic System Pressurized	=	TRUE	Boolean		
					high side driver 1 enabled	=	TRUE	Boolean		
					high side driver 2 enabled	=	TRUE	Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E						
Variable Force Solenoid (VFS)	P2718	Pressure Control Solenoid D Control Circuit Open (clutch4/C23468 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e _HSD1	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				
							battery voltage in range for stability time							
							battery voltage stability time	>=	1	seconds				
							battery voltage	>=	8	volts				
							battery voltage	<=	32	Volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None ECM: None						
Variable Force Solenoid (VFS)	P2720	Pressure Control Solenoid D Control Circuit Low (clutch4/C23468 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e _HSD1	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2721	Pressure Control Solenoid D Control Circuit High (clutch4/C23468 VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD1 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2723	Pressure Control Solenoid E Stuck Off (clutch5/C45678R)	absolute value (attained gear slip)	>= 400 RPM			>= 1.5 seconds when fail time reaches fail limit increment fail event count >= 3 event counts	Type A, One Trip
					clutch solenoid stuck on performance diagnostic monitor test deceleration limit not	= TRUE boolean		
					clutch solenoid stuck on performance diagnostic monitor test return to previous range not	= TRUE boolean		
					PRNDL State not	= park enumeration		
					PRNDL State not	= neutral enumeration		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					while conditinos A and B and C are met, time down delay from clibration to 0.0 seconds			
					delay time calibration	= 0.5 seconds		
					A) neutral condition fault pending	= FALSE boolean		
					B) intrusive shift active	= FALSE boolean		
					C) range shift state	= shift complete enumeration		
					intrusive shift allowed	= TRUE boolean		
					intrusive shift active	= FALSE boolean		
					steady state pressure adapt in progress	= FALSE boolean		
					transmission output speed	>= 100 RPM		
					accelerator pedal position	>= 0.5004883 %		
					accelerator pedal position valid	= TRUE Boolean		
					engine speed valid	= TRUE Boolean		
					D or E			
					D) select battery voltage to enable diagnsotic monitor	= 0 Boolean		
					E) battery voltage	<= 31.999023 volts		
					E) battery voltage	>= 9 volts		
					E) battery voltage time	>= 0.1 sec		
					F or G			
					F) select ignition voltage to enable diagnsotic monitor	= 0 Boolean		
					G) Ignition Voltage	<= 31.999023 Volts		
					G) Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Hydraulic System Pressurized	= TRUE Boolean		
					high side driver 1 enabled	= TRUE Boolean		
					high side driver 2 enabled	= TRUE Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Variable Force Solenoid (VFS)	P2724	Pressure Control Solenoid E Stuck On (clutch5/C45678R)	automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count deceleration limited	>= see Table 32 in supporting documents fail event counts				Type A, One Trip
			automatic transmission shift torque phase test (A) or inertia phase test (B) fail event count no deceleration	>= see Table 33 in supporting documents fail event counts				
			A) absolute value (attained gear slip), fail during post torque phase of transmission automatic shift, before engine speed change, pull up or pull down occurs	<= 40 RPM				
			increment fail time when slip criteria met, fail time for power down shift				>= see Table 29 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift deceleration limited				>= see Table 30 in supporting documents seconds	
			increment fail time when slip criteria met, fail time for up shift or closed throttle down shift no deceleration				>= see Table 31 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
			B) absolute value (command gear slip), fail during inertia phase of transmission automatic shift, engine speed change begins, pull up or pull down	>= 70 RPM				
			increment fail time when slip criteria met, fail time during shift deceleration limited				>= see Table 35 in supporting documents seconds	
			increment fail time when slip criteria met, fail time during shift no deceleration				>= see Table 36 in supporting documents seconds	
							when fail time reaches fail limit increment fail event count above	
					inertia phase test measured gear ratio	>= 0.558		
					inertia phase test measured gear ratio	<= 4.7150002		
					inertia phase test measured gear ratio time	>= 0.15 seconds		
					clutch test enabled	= see Table 10 in supporting documents boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					post torque phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 11 in supporting documents	N*m		
					post torque phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 12 in supporting documents	N*m		
					post torque phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 13 in supporting documents	N*m		
					post torque phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 14 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for upshift or power on down shift	>=	see Table 15 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for upshift or power on down shift	>	see Table 16 in supporting documents	N*m		
					inertia phase test engine torque hysteresis high enable for closed throttle down shift	>=	see Table 17 in supporting documents	N*m		
					inertia phase test engine torque hysteresis low disable for closed throttle down shift	>	see Table 18 in supporting documents	N*m		
					off going clutch pressure	<=	see Table 37 in supporting documents	kPa		
					off going clutch pressure closed throttle down shift delay time	>=	see Table 6 in supporting documents	seconds		
					off going clutch pressure closed power down shift delay time	>=	see Table 42 in supporting documents	seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					off going clutch pressure up shift delay time	>=	see Table 63 in supporting documents	seconds		
					on coming clutch pressure for up shift	>=	see Table 8 in supporting documents	kPa		
					on coming clutch pressure for down shift	>=	see Table 7 in supporting documents	kPa		
					brake pedal position hysteresis high disable	>=	27.000427	%		
					brake pedal position hysteresis low enable	<=	25	%		
					absolute value (attained gear slip)	<=	40	RPM		
					shift type enable	=	see Table 45 in supporting documents	boolean		
					clucth solenoid stuck off intrusive shift request not	=	TRUE	boolean		
					traction control event test suspend not	=	TRUE	boolean		
					transmission output speed	>=	100	RPM		
					accelerator pedal position valid	=	TRUE	Boolean		
					engine speed valid	=	TRUE	Boolean		
					D or E					
					D) select battery voltage to enable diagnsotic monitor	=	0	Boolean		
					E) battery voltage	<=	31.999023	volts		
					E) battery voltage	>=	9	volts		
					E) battery voltage time	>=	0.1	sec		
					F or G					
					F) select ignition voltage to enable diagnsotic monitor	=	0	Boolean		
					G) Ignition Voltage	<=	31.999023	Volts		
					G) Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					Hydraulic System Pressurized	=	TRUE	Boolean		
					high side driver 1 enabled	=	TRUE	Boolean		
					high side driver 2 enabled	=	TRUE	Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E						
Variable Force Solenoid (VFS)	P2727	Pressure Control Solenoid E Control Circuit Open (clutch5/C45678 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e _HSD1	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				
							battery voltage in range for stability time							
							battery voltage stability time	>=	1	seconds				
							battery voltage	>=	8	volts				
							battery voltage	<=	32	Volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None ECM: None						
Variable Force Solenoid (VFS)	P2729	Pressure Control Solenoid E Control Circuit Low (clutch5/C45678 VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e _HSD1	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2730	Pressure Control Solenoid E Control Circuit High (clutch5/C45678 VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD1 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2736	Pressure Control Solenoid F Control Circuit Open (line pressure VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
							battery voltage	<=	32	Volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
Variable Force Solenoid (VFS)	P2738	Pressure Control Solenoid F Control Circuit Low (line pressure VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e_HSD2	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				
							battery voltage in range for stability time							
							battery voltage stability time	>=	1	seconds				
							battery voltage	>=	8	volts				
							battery voltage	<=	32	Volts				
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
Variable Force Solenoid (VFS)	P2739	Pressure Control Solenoid F Control Circuit High (line pressure VFS)	The HWIO reports open crcuit error flag	=	TRUE	Boolean					>=	0.3	Fail Time (Sec)	Type A, One Trip
											out of	0.5	Sample Time (Sec)	
							diagnostic monitor enable calibration	=	TRUE	Boolean				
							VFS source must be high side driver 1 or 2 or 3							
							high side driver VFS source is	=	CeTSCR_e_HSD2	enumeration				
							high side driver VFS source enabled	=	TRUE	Boolean				
							controller power mode state is ignition or accessory	=	TRUE	Boolean				
							battery voltage in range for stability time							
							battery voltage stability time	>=	1	seconds				
							battery voltage	>=	8	volts				
							battery voltage	<=	32	Volts				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
VFS characterization	P27A7	VFS characterization	clutch1/CB1278R pressure control solenoid characterization not programmed	= TRUE Boolean				Type A, One Trip
					manufacture enable counter	= 0 counts		
					memory type updated	= non-volatile memory		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
VFS characterization	P27A8	VFS characterization	clutch2/CB12345R pressure control solenoid characterization not programmed	= TRUE Boolean				Type A, One Trip
					manufacture enable counter	= 0 counts		
					memory type updated	= non-volatile memory		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
VFS characterization	P27A9	VFS characterization	clutch3/C13567 pressure control solenoid characterization not programmed	= TRUE Boolean				Type A, One Trip
					manufacture enable counter	= 0 counts		
					memory type updated	= non-volatile memory		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
VFS characterization	P27AA	VFS characterization	clutch4/C23468 pressure control solenoid characterization not programmed	= TRUE Boolean				Type A, One Trip
					manufacture enable counter	= 0 counts		
					memory type updated	= non-volatile memory		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value			Secondary Malfunction	Enable Conditions			Time Required			Mil Illum.
VFS characterization	P27AB	VFS characterization	clutch5/C45678R pressure control solenoid characterization not programmed	=	TRUE	Boolean								Type A, One Trip
							manufacture enable counter	=	0	counts				
							memory type updated	=	non-volatile memory					
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
VFS characterization	P27AC	VFS characterization	line pressure control solenoid characterization not programmed	=	TRUE	Boolean								Type A, One Trip
							manufacture enable counter	=	0	counts				
							memory type updated	=	non-volatile memory					
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
VFS characterization	P27AD	VFS characterization	TCC pressure control solenoid characterization not programmed	=	TRUE	Boolean								Type A, One Trip
							manufacture enable counter	=	0	counts				
							memory type updated	=	non-volatile memory					
				Disable Conditions:			MIL not Illuminated for DTC's:	TCM: None						
								ECM: None						
Torque Converter Clutch (TCC)	P2808	TCC System Stuck OFF	TCC Pressure	>=	750	Kpa					>=	2	Enable Time (Sec)	Type B, Two Trips
			TCC capacity	>=	0	%					>=	0	Enable Time (Sec)	
			Either Condition (A) or (B) Must be Met											
			(A) TCC Slip Error @ TCC On Mode	>=	see Table 1 in Supporting Documents	RPM					>=	4	Fail Time (Sec)	
			(B) TCC Slip @ Lock On Mode	>=	130	RPM					>=	4	Fail Time (Sec)	
			If Above Conditions Have been Met, and Fail Timer Expired, Increment Fail Counter								>=	3	TCC Stuck Off Fail Counter	
							TCC Mode	=	On or Lock					
							TCC system stuck off diagnostic monitor enable c	=	1					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					default valve state	= high (active)		
					absolute value of attained gear slip	>= 25 RPM		
					attained gear	>= CeCGSR_e_CR_Fourth		
					range shift state	= shift complete		
					Hydraulic System Pressurized	= TRUE Boolean		
					battery voltage	<= 31.999023 volts		
					battery voltage	>= 9 volts		
					battery voltage time	>= 0.1 sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Engine Torque	>= 50 N*m		
					Engine Torque	<= 8191.75 N*m		
					Throttle Position	>= 8.0001831 Pct		
					Throttle Position	<= 99.998474 Pct		
					Transmission Fluid Temperature	>= -6.65625 ºC		
					Transmission Fluid Temperature	<= 130 ºC		
					PTO Not Active	= TRUE Boolean		
					Engine Torque Signal Valid	= TRUE Boolean		
					Accelerator Pedal Position Signal Valid	= TRUE Boolean		
					P2808 Status is	≠ Test Failed This Key On		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P07BF, P07C0, P0722, P0723, P077C, P077D, P2808, P2812, P2814, P2815 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		
Torque Converter Clutch (TCC)	P2809	TCC System Stuck ON	TCC Slip Speed	>= -50 RPM				Type A, One Trip
			TCC Slip Speed	<= 30 RPM			>= 1.5 Fail Time (Sec)	
			If Above Conditions Have been Met, and Fail Timer Expired, Increment Fail Counter				>= 6 Fail Counter	
					TCC Mode	= Off		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					default valve state	=	high (active)			
					default valve state previous	=	low to high			
					set default valve state timer	=	see Table 24 in Supporting Documents	seconds		
					default valve state timer times down to zero (0.0) when default valve state not	=	high (active)			
					default valve state timer times down to zero (0.0) when default valve state previous not	=	low to high			
					either A or B ro C must be met					
					A) default valve state	=	low to high			
					B) default valve state timer	>	0	seconds		
					C) low TCC slip fail timer	>	0	seconds		
					clutch solenoid stuck off performance (neutral) test active	=	FALSE	Boolean		
					clutch solenoid stuck on performance (tie-up) test active	=	FALSE	Boolean		
					TCC Slip Speed	<=	85	RPM		
					derivative TCC slip speed	<=	see Table 25 in Supporting Documents	RPM/sec		
					TCC system stuck on diagnostic monitor enable c	=	1			
					Engine Speed	<=	5500	RPM		
					Engine Speed	>=	400	RPM		
					Vehicle Speed HI	<=	45	KPH		
					Engine Torque	<=	800	Nm		
					Engine Torque	>=	55	Nm		
					Current Range	≠	Neutral	Range		
					Current Range	≠	Reverse	Range		
					Transmission Fluid Temperature	<=	130	ºC		
					Transmission Fluid Temperature	>=	-6.65625	ºC		
					Throttle Position Hyst High	>=	3.9993286	Pct		
					AND					
					Max Vehicle Speed to Meet Throttle Enable	<=	8	KPH		
					Once Hyst High has been met, the enable will remain while Throttle Position	>=	0.9994507	Pct		
					Disable for Throttle Position	>=	94.999695	Pct		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Disable if PTO active and value true	= 1		
					enable if tap up/down mode is false or tap up/down TCC calibration value is false	= 0 Boolean		
					enable if manual up/down mode is false or manual up/down TCC calibration value is false	= 0 Boolean		
					enable if misfire disengage TCC is false or value TCC misfire calibration value is false	= 0 Boolean		
					4 Wheel Drive Low Active	= FALSE Boolean		
					battery voltage	<= 31.999023 volts		
					battery voltage	>= 9 volts		
					battery voltage time	>= 0.1 sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
					Engine Torque Signal Valid	= TRUE Boolean		
					Throttle Position Signal Valid	= TRUE Boolean		
					P0742 Status is	≠ Test Failed This Key On		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P07BF, P07C0, P0722, P0723, P077C, P077D, P2809, P2812, P2814, P2815 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E		
Variable Force Solenoid (VFS)	P2812	Pressure Control Solenoid G Control Circuit Open (TCC pressure VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2814	Pressure Control Solenoid G Control Circuit Low (TCC pressure VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Variable Force Solenoid (VFS)	P2815	Pressure Control Solenoid G Control Circuit High (TCC pressure VFS)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
default valve on/off valve solenoid	P2817	Hydraulic on/off Control Solenoid H Stuck Off (default valve on/off solenoid)	absolute value (attained gear slip) 4th gear commanded	>= 400 RPM	6th gear intrusive shift command when fail time reaches fail limit		>= 1.5 seconds	Type A, One Trip
					attained gear when intrusive 6th gear command	= 3rd		
					attained gear slip 3rd gear	<= 75 RPM		
					3rd gear attained time	>= 0.25 seconds		
					intrusive 6th gear commanded event count	>= 2 counts		
							>= 2 counts	
					clutch solenoid stuck on performance diagnostic monitor test deceleration limit not	= TRUE boolean		
					clutch solenoid stuck on performance diagnostic monitor test return to previous range not	= TRUE boolean		
					PRNDL State not	= park enumeration		
					PRNDL State not	= neutral enumeration		
					while conditinos A and B and C are met, time down delay from clibration to 0.0 seconds			
					delay time calibration	= 0.5 seconds		
					A) neutral condition fault pending	= FALSE boolean		
					B) intrusive shift active	= FALSE boolean		
					C) range shift state	= shift complete enumeration		
					intrusive shift allowed	= TRUE boolean		
					intrusive shift active	= FALSE boolean		
					steady state pressure adapt in progress	= FALSE boolean		
					transmission output speed	>= 100 RPM		
					accelerator pedal position	>= 0.5004883 %		
					accelerator pedal position valid	= TRUE Boolean		
					engine speed valid	= TRUE Boolean		
					D or E			
					D) select battery voltage to enable diagnsotic monitor	= 0 Boolean		
					E) battery voltage	<= 31.999023 volts		
					E) battery voltage	>= 9 volts		
					E) battery voltage time	>= 0.1 sec		
					F or G			
					F) select ignition voltage to enable diagnsotic monitor	= 0 Boolean		
					G) Ignition Voltage	<= 31.999023 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					G) Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
					Hydraulic System Pressurized	=	TRUE	Boolean		
					high side driver 1 enabled	=	TRUE	Boolean		
					high side driver 2 enabled	=	TRUE	Boolean		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, 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, P2534 ECM: P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E				
default valve on/off valve solenoid	P2818	Hydraulic on/off Control Solenoid H Stuck On (default valve on/off solenoid)	TCC slip speed	<= 6 RPM					>= 0.5 seconds >= 3 counts >= 5 counts	Type B, Two Trips
					delay time after TCC intrusive command pressure reaches intrusive value	>=	see Table 28 in supporting documents	seconds		
					TCC intrusive command pressure	>=	600	kPa		
					test delay timer calibration	=	0.5	seconds		
					test delay timer times down from calibration to zero (0.0) when all of the following conditinos are met					
					engine speed	>=	400	RPM		
					engine speed	<=	900	RPM		
					transmission temperature	>=	0	ºC		
					transmission temperature	<=	40	ºC		
					PRNDL state	=	park	enumeration		
					Hydraulic System Pressurized	=	TRUE	Boolean		
					battery voltage	<=	31.999023	volts		
					battery voltage	>=	9	volts		
					battery voltage time	>=	0.1	sec		
					Ignition Voltage	<=	31.999023	Volts		
					Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P07BF, P07C0, P2812, P2814, P2815 ECM: none		
default valve on/off solenoid	P281D	Pressure Control Solenoid H Control Circuit Low (default valve on/off solenoid)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD1 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
default valve on/off solenoid	P281E	Pressure Control Solenoid H Control Circuit High (default valve on/off solenoid)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD1 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
clutch2/CB12345R boost valve on/off solenoid	P2824	Pressure Control Solenoid J Control Circuit High (clutch2/CB12345R boost valve on/off solenoid)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD1 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
clutch2/CB12345R boost valve on/off solenoid	P2826	Pressure Control Solenoid J Control Circuit Low (clutch2/CB12345R boost valve on/off solenoid)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
clutch2/CB12345R boost valve on/off solenoid	P2827	Pressure Control Solenoid J Control Circuit High (clutch2/CB12345R boost valve on/off solenoid)	The HWIO reports open crcuit error flag	= TRUE Boolean			>= 0.3 Fail Time (Sec) out of 0.5 Sample Time (Sec)	Type A, One Trip
					diagnostic monitor enable calibration	= TRUE Boolean		
					VFS source must be high side driver 1 or 2 or 3			
					high side driver VFS source is	= CeTSCR_e_HSD2 enumeration		
					high side driver VFS source enabled	= TRUE Boolean		
					controller power mode state is ignition or accessory	= TRUE Boolean		
					battery voltage in range for stability time			
					battery voltage stability time	>= 1 seconds		
					battery voltage	>= 8 volts		
					battery voltage	<= 32 Volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Communication	U0073	Controller Area Network Bus Communication Error	CAN Hardware Circuitry Detects a Bus Voltage Error (CAN bus off)	= TRUE Boolean			>= 62 counts	Type A, One Trip
			Bus off delay time	>= 0.1125 sec			>= 70 counts	
					all conditions A and B and C below must occur for stabilization time			
					Bus Stabilization time	>= 3 seconds		
					A) Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					A) normal serial data communication enabled	= TRUE Boolean		
					A) P0073 status not	= fault active		
					B) secured controller or emission critical then use ignition voltage	= CeCANR_e_OBDII_Dsbl Boolean		
					B) secureed controller or emission critical Ignition Voltage	>= 11 volts		
					B) Power Mode	= Run		
					B) secured controller or emission critical then use controller power mode	= CeCANR_e_OBDII_Dsbl Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					B) Power Mode	= Run		
					C) ignition off enable	= 1 Boolean		
					C) Power Mode	= accessory		
					C) battery voltage	>= 11 volts		
					all conditions A and B below must occur			
					A) post clear code timer	>= 0.15 seconds		
					B) when Propulsion System Active use low voltage check	= FALSE Boolean		
					NOT in low voltage engine crank condition defined by A or B below during, for low voltage mode time			
					low voltage mode time	>= 2.50E-02 seconds		
					A) low voltage mode hysteresis time	<= 0.1 seconds		
					B) ignition voltage, set low voltage mode	<= 6.4091797 volts		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: None ECM: None		
Communication	U0100	Lost Communications with ECM (Engine Control Module)	TCM Rx message missed frame		fail times are caculated based on Rx message enable calibration set to CeCANR_e_BusA_ECM	Tx controller		Type A, One Trip
			TCM Rx frame message missed frame	= TRUE Boolean	TCM Rx frame calibration enabled	≠ see Table 64 in supporting documents enumeration	>= see Table 65 in supporting documents seconds	
					Frame recovery stabilization delay	>= 0.5 seconds		
					all conditions A and B and C below must occur for stabilization time			
					Bus Stabilization time	>= 3 seconds		
					A) Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					A) normal serial data communication enabled	= TRUE Boolean		
					A) P0073 status not	= fault active		
					B) secured controller or emission critical then use ignition voltage	= CeCANR_ e_OBDII_D sbl Boolean		
					B) secureed controller or emission critical Ignition Voltage	>= 11 volts		
					B) Power Mode	= Run		
					B) secured controller or emission critical then use controller power mode	= CeCANR_ e_OBDII_D sbl Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					B) Power Mode	=	Run			
					C) ignition off enable	=	1	Boolean		
					C) Power Mode	=	accessory			
					C) battery voltage	>=	11	volts		
					all conditions A and B below must occur					
					A) post clear code timer	>=	0.15	seconds		
					B) when Propulsion System Active use low voltage check	=	FALSE	Boolean		
					NOT in low voltage engine crank condition defined by A or B below during, for low voltage mode time					
					low voltage mode time	>=	2.50E-02	seconds		
					A) low voltage mode hysteresis time	<=	0.1	seconds		
					B) ignition voltage, set low voltage mode	<=	6.4091797	volts		
					U0100 fault status is not	=	fault active			
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None				
Communication	U0121	Loss Communications with ABS (Anti-lock Brake System)	TCM Rx message missed frame		fail times are caculated based on the following Rx messages enable calibration set to CeCANR_e_BusA_ABS		Tx controller			Special No MIL
			TCM Rx frame message missed frame	= TRUE Boolean	TCM Rx frame calibration enabled	≠	see Table 64 in supporting documents	enumeration	>= see Table 65 in supporting documents seconds	
					Frame recovery stabilization delay	>=	0.5	seconds		
					all conditions A and B and C below must occur for stabilization time					
					Bus Stabilization time	>=	3	seconds		
					A) Service mode $04 active and end of trip pocessing active	=	FALSE	Boolean		
					A) normal serial data communication enabled	=	TRUE	Boolean		
					A) P0073 status not	=	fault active			
					B) secured controller or emission critical then use ignition voltage	=	CeCANR_ e_OBDII_D sbl	Boolean		
					B) secureed controller or emission critical Ignition Voltage	>=	11	volts		
					B) Power Mode	=	Run			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					B) secured controller or emission critical then use controller power mode	= CeCANR_e_OBDII_Dsbl Boolean		
					B) Power Mode	= Run		
					C) ignition off enable	= 1 Boolean		
					C) Power Mode	= accessory		
					C) battery voltage	>= 11 volts		
					all conditions A and B below must occur			
					A) post clear code timer	>= 0.15 seconds		
					B) when Propulsion System Active use low voltage check	= FALSE Boolean		
					NOT in low voltage engine crank condition defined by A or B below during, for low voltage mode time			
					low voltage mode time	>= 2.50E-02 seconds		
					A) low voltage mode hysteresis time	<= 0.1 seconds		
					B) ignition voltage, set low voltage mode	<= 6.4091797 volts		
					U0121 fault status is not	= fault active		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None		
Communication	U0140	Loss Communications with BCM (Body Control Module)	TCM Rx message missed frame		fail times are caculated based on the following Rx messages enable calibration set to CeCANR_e_BusA_BCM	Tx controller		Special No MIL
			TCM Rx frame message missed frame	= TRUE Boolean	TCM Rx frame calibration enabled	≠ see Table 64 in supporting documents enumeration	>= see Table 65 in supporting documents seconds	
					Frame recovery stabilization delay	>= 0.5 seconds		
					all conditions A and B and C below must occur for stabilization time			
					Bus Stabilization time	>= 3 seconds		
					A) Service mode $04 active and end of trip pocessing active	= FALSE Boolean		
					A) normal serial data communication enabled	= TRUE Boolean		
					A) P0073 status not	= fault active		
					B) secured controller or emission critical then use ignition voltage	= CeCANR_e_OBDII_Dsbl Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
					B) secureed controller or emission critical Ignition Voltage	>= 11 volts		
					B) Power Mode	= Run		
					B) secured controller or emission critical then use controller power mode	= CeCANR_ e_OBDII_D sbl Boolean		
					B) Power Mode	= Run		
					C) ignition off enable	= 1 Boolean		
					C) Power Mode	= accessory		
					C) battery voltage	>= 11 volts		
					all conditions A and B below must occur			
					A) post clear code timer	>= 0.15 seconds		
					B) when Propulsion System Active use low voltage check	= FALSE Boolean		
					NOT in low voltage engine crank condition defined by A or B below during, for low voltage mode time			
					low voltage mode time	>= 2.50E-02 seconds		
					A) low voltage mode hysteresis time	<= 0.1 seconds		
					B) ignition voltage, set low voltage mode	<= 6.4091797 volts		
					U0140 fault status is not	= fault active		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Transmission Control Module (TCM)	C124F	The lateral accleration sensor signal failed at a low voltge	hardware configuration	= CeLATR_e_VoltageDirectProp	transient delay timer	>= 30 Sec	>= 75 Sec	Special No MIL
			Lateral accleration sensor raw signal	<= -3.849999905 g's			out of 120 Sec	
			hardware configuration	= CeLATR_e_VoltageDirectProp				
			Lateral accleration magnitude	>= -3.849999905 g's				
					Lateral acceleration low voltage diagnostic enable calibration	= 1		
					Battery Voltage	<= 31.999023 Volts		
					Battery Voltage	>= 9 Volts		
					Battery voltage is within the allowable limits for	>= 0.1 Sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None		
Transmission Control Module (TCM)	C1250	The lateral accleration sensor signal failed at a high voltge	hardware configuration	= CeLATR_e_VoltageDirectProp	transient delay timer	>= 30 Sec	>= 75 Sec	Special No MIL
			Lateral accleration sensor raw signal	>= 3.849999905 g's			out of 120 Sec	
			hardware configuration	= CeLATR_e_VoltageDirectProp				
			Lateral accleration magnitude	<= 3.849999905 g's				
					Lateral acceleration high voltage diagnostic enable calibration	= 1		
					Battery Voltage	<= 31.999023 Volts		
					Battery Voltage	>= 9 Volts		
					Battery voltage is within the allowable limits for	>= 0.1 Sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: U0073 ECM: None		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions	Time Required	Mil Illum.
Transmission Control Module (TCM)	C1251	The lateral accleration signal is stuck at a high magnitude in range	absolute value (lateral accleration)	>= 0.529999971 g's	absolute value (lateral accleration) for stablity	>= 0.53 g's	>= 75 Sec	Special No MIL
			absolute value (lateral accleration)	<= 3.849999905 g's	absolute value (lateral accleration) for stablity	<= 3.8499999 g's		
					stability time	>= 30 Sec		
					Diagnostic shifting override command	= FALSE Boolean		
					Attained Gear State	= 1st through 8th		
					Attained Gear Slip	<= 100 RPM		
					Transmission Type	= Clutch to Clutch Transmission		
					High Side Drivers enabled	= TRUE Boolean		
					Vehicle Speed	>= 15 kph		
					Lateral acceleration stuck in range diagnostic enable calibration	= 1		
					Battery Voltage	<= 31.999023 Volts		
					Battery Voltage	>= 9 Volts		
					Battery voltage is within the allowable limits for	>= 0.1 Sec		
					Ignition Voltage	<= 31.999023 Volts		
					Ignition Voltage	>= 9 Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	= FALSE Boolean		
					Ignition voltage and SFL conditions met for	>= 0.1 Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0716, P0717, P0721, P0722, P0723, P07BF, P07C0, P077B, P077C, P077D, P215C, U0073 ECM: None		
Transmission Cooling Fan Performance	P184F	Transmission Cooling Fan Performance	delta transmission fluid temperature fail = transmission fluid temperature start of test - current value transmission fluid temperature	<= Table Based Time Please see Table 27 in Supporting Documents ºC			>= 2 counts (100 msec continuous)	Type B, Two Trips
			transmission fluid temperature start of test is latched to the current value of transmission fluid temperature when transmission cooling fan run time is not zero (0.0)					
					use outside air temperature (emission system) calibration	= 0		
					OR			
					outside air temperature available (emission system) and all of the following	= TRUE Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Malfunction	Enable Conditions			Time Required	Mil Illum.
					outside ait temperature (emission system)	>=	-8192	ºC		
					outside ait temperature (emission system)	<=	58	ºC		
					transmission fluid temperature	<=	255.99219			
					transmission fluid temperature	>=	110			
					transmission fluid temperature valid	=	TRUE	Boolean		
					transmission cooling fan state command	=	ON			
					transmission cooling fan command capacity	>=	18.499756	%		
					transmission cooling fan run time	>=	300	seconds		
					diagnotic monitor enable calibration	=	1			
					outside air temperature valid	=	TRUE	Boolean		
					battery voltage	<=	31.999023	volts		
					battery voltage	>=	9	volts		
					battery voltage time	>=	0.1	sec		
					Ignition Voltage	<=	31.999023	Volts		
					Ignition Voltage	>=	9	Volts		
					Service Fast Learn (SFL) Mode VBS Failsafe	=	FALSE	Boolean		
					Ignition voltage and SFL conditions met for	>=	0.1	Sec		
				Disable Conditions:	MIL not Illuminated for DTC's:	TCM: P0711, P0712, P0713				
						ECM: P0072, P073, P074				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lateral Acceleration Sensor Circuit Low	C124F	Controller specific analog circuit diagnoses the raw lateral acceleration signal for a short to ground or open fault by comparing raw signal value to fail thresholds.	raw lateral acceleration signal when sensor type is directly proportional OR raw lateral acceleration signal when sensor type is inversely proportional update raw lateral acceleration signal stability time, fail and sample time, 50 millisecond update rate	≤ -3.8500 g ≥ -3.8500 g (≤ 0.5 Ω impedance between signal and controller ground)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw lateral acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lateral Acceleration Sensor Circuit High	C1250	Controller specific analog circuit diagnoses the raw lateral acceleration signal for a short to power or open fault by comparing raw signal value to fail thresholds.	raw lateral acceleration signal when sensor type is directly proportional OR raw lateral acceleration signal when sensor type is inversely proportional update raw lateral acceleration signal stability time, fail and sample time, 50 millisecond update rate	≥ 3.8500 g ≤ 3.8500 g (≤ 0.5 Ω impedance between signal and controller power)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw lateral acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Lateral Acceleration Sensor Performance	C1251	Controller specific analog circuit diagnoses the raw lateral acceleration signal for a signal value that is stuck in a valid range by comparing raw signal value to fail thresholds.	ABS(raw lateral acceleration signal) AND ABS(raw lateral acceleration signal) update raw lateral acceleration signal fail, 50 millisecond update rate	≥ 0.5300 g ≤ 3.8500 g	battery voltage run crank voltage diagnostic monitor enable update raw lateral acceleration signal stablity time: TOSS vehicle speed automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear attained gear slip ABS(raw lateral acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean ≥ 15.0 KPH = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≤ 100.0 RPM < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA	raw lateral acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Longitudinal Acceleration Sensor Circuit Low	C1252	Controller specific analog circuit diagnoses the raw longitudinal acceleration signal for a short to ground or open fault by comparing raw signal value to fail thresholds.	raw longitudinal acceleration signal when sensor type is directly proportional OR raw longitudinal acceleration signal when sensor type is inversely proportional update raw longitudinal acceleration signal stability time, fail and sample time, 50 millisecond update rate	≤ -3.8500 g ≥ -3.8500 g (≤ 0.5 Ω impedance between signal and controller ground)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw longitudinal acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Longitudinal Acceleration Sensor Circuit High	C1253	Controller specific analog circuit diagnoses the raw longitudinal acceleration signal for a short to power or open fault by comparing raw signal value to fail thresholds.	raw longitudinal acceleration signal when sensor type is directly proportional OR raw longitudinal acceleration signal when sensor type is inversely proportional update raw longitudinal acceleration signal stability time, fail and sample time, 50 millisecond update rate	≥ 3.8500 g ≤ 3.8500 g (≤ 0.5 Ω impedance between signal and controller power)	battery voltage run crank voltage diagnostic monitor enable sensor type is either directly proportional or inversely proportional U0073 fault active U0073 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = CeLATR_e_VoltageDirectProp = FALSE = FALSE	raw longitudinal acceleration signal stability time ≥ 30.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Longitudinal Acceleration Sensor Performance	C1254	Controller specific analog circuit diagnoses the raw longitudinal acceleration signal rationalized against the TOSS vehicle speed acceleration. The diagnostic monitor can be designed to detect an invalid longitudinal acceleration signal based on the TOSS vehicle speed windows and TOSS vehicle speed acceleration, 4 windows can be enabled. The delta between the TOSS vehicle speed acceleration and longitudinal acceleration signal is taken within each window to verify the delta is small, no failure indicated, or the delta is large indicating the longitudinal acceleration signal is in error.	ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 1 fail time, 50 millisecond update rate	≥ 0.5300 g	battery voltage run crank voltage diagnostic monitor enable region 1 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear attained gear slip ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal acceleration signal) update region 1 sample time: brake pedal position engine torque TOSS vehicle speed acceleration TOSS vehicle speed TOSS vehicle speed	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≤ 100.0 RPM ≥ 0.5300 g ≤ 3.8500 g ≤ 0.70 % ≥ 80.0 Nm ≥ 0.1500 g ≥ 15.0 KPH ≤ 200.0 KPH	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate region 1 fail time ≥ 75.0 seconds out of region 1 sample time ≥ 120.0 seconds, 50 millisecond update rate	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	< 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError		
			ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 2 fail time, 50 millisecond update rate	≥ 0.0000 g	battery voltage run crank voltage diagnostic monitor enable region 2 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear attained gear slip ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≤ 100.0 RPM ≥ 0.5300 g ≤ 3.8500 g	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					acceleration signal) update region 2 sample time: brake pedal position engine torque TOSS vehicle speed acceleration TOSS vehicle speed TOSS vehicle speed ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	 ≤ 0.70 % ≥ 80.0 Nm ≥ 0.1500 g ≥ 0.0 KPH ≤ 0.0 KPH < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError	 region 2 fail time ≥ 75.0 seconds out of region 2 sample time ≥ 120.0 seconds, 50 millisecond update rate	
			ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 3 fail time, 50 millisecond update rate	≥ 0.0000 g	battery voltage run crank voltage diagnostic monitor enable region 3 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear attained gear slip ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal acceleration signal) update region 3 sample time: brake pedal position engine torque ABS(TOSS vehicle speed acceleration) TOSS vehicle speed ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	= FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≤ 100.0 RPM ≥ 0.5300 g ≤ 3.8500 g ≤ 0.70 % ≥ 80.0 Nm ≤ 0.1000 g ≥ 0.0 KPH < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError	region 3 fail time ≥ 75.0 seconds out of region 3 sample time ≥ 120.0 seconds, 50 millisecond update rate	
			ABS(TOSS vehicle speed acceleration - raw longitudinal acceleration signal) update raw longitudinal acceleration signal region 4 fail time, 50 millisecond update rate	≥ 0.0000 g	battery voltage run crank voltage diagnostic monitor enable region 3 specific enable update raw lateral longitudinal acceleration signal stablity time: TOSS vehicle speed TOSS vehicle speed acceleration automatic transmission is clutch to clutch OR dual	≥ 11.00 volts ≥ 11.00 volts = 1 Boolean = 0 Boolean ≥ 15.0 KPH ≤ 0.5300 g = TRUE	raw lateral longitudinal acceleration signal stability time ≥ 10.0 seconds, fail time ≥ 75.0 seconds out of sample time ≥ 120.0 seconds, 50 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					clutch high side drive 1 enable high side drive 2 enable diagnsotic fault sequence gear active P0716 fault active P0716 test fail this key on P0717 fault active P0717 test fail this key on P07BF fault active P07BF test fail this key on P07C0 fault active P07C0test fail this key on attained gear attained gear slip ABS(raw longitudinal acceleration signal) AND ABS(raw longitudinal acceleration signal) update region 4 sample time: brake pedal position engine torque TOSS vehicle speed acceleration TOSS vehicle speed TOSS vehicle speed ABS(raw longitudinal acceleration signal) update sample time U0073 fault active U0073 test fail this key on DTCs not fault active	 = TRUE = TRUE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1st thru 10th ≤ 100.0 RPM ≥ 0.5300 g ≤ 3.8500 g ≤ 0.70 % ≤ 80.0 Nm ≤ 0.1500 g ≥ 0.0 KPH ≤ 0.0 KPH < 0.5300 g = FALSE = FALSE VehicleSpeedSensor_FA VehicleSpeedSensorError	region 4 fail time ≥ 75.0 seconds out of region 4 sample time ≥ 120.0 seconds, 50 millisecond update rate	

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	40 failures out of 50 samples 100 ms / sample	Type A, 1 Trips

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
ECM RAM Failure	P0604	Indicates that the ECM has detected a RAM fault. This includes Primary Processor System RAM Fault, Primary Processor Cache RAM Fault, Primary Processor TPU RAM Fault, Primary Processor Update Dual Store RAM Fault, Primary Processor Write Protected RAM Fault, and Secondary Processor RAM Fault. This diagnostic runs continuously.	Indicates that the primary processor is unable to correctly read data from or write data to system RAM. Detects data read does not match data written >=	254 counts			Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop)	Type A, 1 Trips
			Indicates that the primary processor is unable to correctly read data from or write data to cached RAM. Detects data read does not match data written >=	3 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 >	0.40000 s			When dual store updates occur.	

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

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal ECM Processor Integrity Fault	P0606	Indicates that the ECM has detected an internal processor integrity fault. These include diagnostics done on the SPI Communication as well as a host of diagnostics for both the primary and secondary processsors.	Loss or invalid message of SPI communication from the Secondary Processor at initialization detected by the Primary Processor or loss or invalid message of SPI communication from the Secondary Processor after a valid message was received by the Primary Processor	Loss or invalid message at initialization detected or loss or invalid message after a valid message was recieved	Run/Crank voltage Run/Crank voltage	>= 8.00 Volts or >= 11.00 Volts, else the failure will be reported for all conditions	In the primary processor, 8 / 16 counts intermittent or 10 counts continuous; 100 counts continuous @ initialization. 12.5 ms /count in the ECM main processor	Type A, 1 Trips
			Loss or invalid message of SPI communication from the Primary Processor at initialization detected by the Secondary Processor or loss or invalid message of SPI communication from the Primary Processor after a valid message was received by the Secondary Processor	Loss or invalid message at initialization detected or loss or invalid message after a valid message was recieved			In the secondary processor, 20 / 200 counts intermittent or 0.1875 s continuous; 0.4750 s continuous @ initialization. 12.5 ms /count in the ECM secondary processor	
			Checks for stack over or underflow in secondary processor by looking for corruption of known pattern at stack boundaries. Checks number of stack over/ under flow since last powerup reset >=	5		KeMEMD_b_StackLimitTestEnbl == 1 Value of KeMEMD_b_StackLimitTestEnbl is: 1 . (If 0, this test is disabled)	variable, depends on length of time to corrupt stack	
			MAIN processor is verified by responding to a seed sent from the secondary with a key response to secondary. Checks number of incorrect keys	2 incorrect seeds within 8 messages, 0.2000 seconds		ignition in Run or Crank	150 ms for one seed continually failing	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			received > or Secondary processor has not received a new within time limit					
			Time new seed not received exceeded			always running	0.450 seconds	
			MAIN processor receives seed in wrong order			always running	3 / 17 counts intermittent. 50 ms/count in the ECM main processor	
			2 fails in a row in the Secondary processor's ALU check			KePISD_b_ALU_TestEnbld == 1 Value of KePISD_b_ALU_TestEnbld is: 1 . (If 0, this test is disabled)	25 ms	
			2 fails in a row in the Secondary processor's configuration register masks versus known good data			KePISD_b_ConfigRegTestEnbld == 1 Value of KePISD_b_ConfigRegTestEnbld is: 1 . (If 0, this test is disabled)	12.5 to 25 ms	
			Secondary processor detects an error in the toggling of a hardware discrete line controlled by the MAIN processor: number of discrete changes > = or < = over time window(50ms)	7 17		KePISD_b_MainCPU_SOH_FltEnbld == 1 Value of KePISD_b_MainCPU_SOH_FltEnbld is: 0 . (If 0, this test is disabled) time from initialization >= 0.4875 seconds	50 ms	
			Software background task first pass time to complete exceeds			Run/Crank voltage > 6.41	35.000 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 >=	5		KeMEMD_b_StackLimitTestEnbl == 1 Value of KeMEMD_b_StackLimitTestEnbl is: 1 . . (If 0, this test is disabled)	variable, depends on length of time to corrupt stack	
			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	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			Checks for ECC (error 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 >=	3 (results in MIL), 5 (results in MIL and remedial action)		KeMEMD_b_RAM_ECC_CktTestEnbl == 1 Value of KeMEMD_b_RAM_ECC_CktTestEnbl is: 1 . (If 0, this test is disabled)	variable, 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_XferTestEnbld == 1 Value of KePISD_b_DMA_XferTestEnbld is: 1 . (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	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							processor	
			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.
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 A, 1 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.
Actuator Supply Voltage Circuit Low	P0658	Controller specific output driver circuit diagnoses the high sided driver circuit 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	diagnostic monitor enable high side drive ON service mode $04 not active service fast learn not active P0658 fault active P0658 test fail this key on	= 1 Boolean = TRUE = FALSE = FALSE	fail count ≥ 6 counts out of sample count ≥ 2,400 counts 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
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	>= 8.00 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.
Transmission Fluid Temperature (TFT) Sensor Performance	P0711	The diagnostic monitor will verify the time to transmission fluid temperature warm up based on the raw transmission fluid temperature sesnor, any intermittent signal that causes multiple unrealistic delta changes (intermittent faults) based on the raw transmission fluid temperature sesnor, and, raw transmission fluid temperature sesnor signal stuck in valid range.	raw transmission fluid temperature and the transmission fluid temperature warm up time has elapsed	≤ 15.0 °C			transmission fluid temperature warm up time ≥ **transmission fluid temperature warm up time** seconds	Type B, 2 Trips
					diagnsotic monitor enable	= 1 Boolean		
					P0712 NOT fault active			
					P0713 NOT fault active			
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					warm up test enable	= 1 Boolean		
					TFT rationality diagnostic monitor enabled	= VeTFSR_b_TFT_RatlEnbl		
					driver accelerator pdeal position	≥ 5.0 %		
					engine torque	≥ 50.0 Nm		
					engine speed	≥ 500.0 RPM		
					vehicle speed	≥ 10.0 KPH		
					engine coolant temperature	≥ -40.0 °C		
					engine coolant temperature	≤ 150.0 °C		
					raw transmission fluid temperature	≥ -40.0 °C		
					raw transmission fluid temperature	≤ 150.0 °C		
					P2818 fault active	= FALSE		
					P2818 test fail this key on	= FALSE		
					DTCs not fault active			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						EngineTorqueEstInaccurate AcceleratorPedalFailure CrankSensor_FA ECT_Sensor_FA VehicleSpeedSensor_FA		
			current transmission fluid temperature string length = previous transmission fluid temperature transmission temperature string length + (raw transmission fluid temperature - previous raw transmission fluid temperature, update rate 100 milliseconds, increment sample count	≥ 80.0 °C			sample count ≥ 10 counts evaluate fail temperature threshold, 100 millisecond update rate, if transmission fluid temperature string length above fail threshold increment fail time fail time ≥ 8.0 seconds out of sample time ≥ 12.0 seconds	
					diagnsotic monitor enable P0712 NOT fault active P0713 NOT fault active battery voltage	= 1 Boolean ≥ 9.00 volts	 battery voltage time ≥ 0.100 seconds	
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					intermittent test enable propulsion system active	= 1 Boolean = TRUE		
			raw transmission fluid temperature - previous	≤ 0.0000 °C			fail time ≥ 300.0 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			raw transmission fluid temperature, update rate 100 milliseconds, update fail time		diagnsotic monitor enable P0712 NOT fault active P0713 NOT fault active battery voltage run crank voltage stuck in range test enable propulsion system active raw transmission fluid temperature raw transmission fluid temperature	= 1 Boolean ≥ 9.00 volts ≥ 9.00 volts = 1 Boolean = TRUE ≥ -40.0 °C ≤ 150.0 °C	 battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature Sensor Circuit Low Voltage	P0712	Controller specific analog circuit diagnoses the transmission fluid temperature sensor and wiring for a short to ground fault by comparing a voltage measurement to controller specific voltage thresholds, converted to a resistance value.	circuit resistance update fail time 1 seconds update rate	≤ 13.500 Ω	diagnostic monitor enable battery voltage run crank voltage run crank voltage in range time	= 1 Boolean ≥ 9.00 volts ≥ 9.00 volts	fail time ≥ 5.00 seconds out of sample time ≥ 6.00 seconds 1 seconds update rate battery voltage in range time ≥ 0.100 seconds run crank voltage in range time ≥ 0.100 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Fluid Temperature Sensor Circuit Low Voltage	P0713	Controller specific analog circuit diagnoses the transmission fluid temperature sensor and wiring for an open circuit or short to voltage failure by comparing a voltage measurement to controller specific voltage thresholds, converted to a resistance value.	circuit resistance update fail time 1 seconds update rate	≥ 49,411,396.0 Ω			fail time ≥ 5.00 seconds out of fail time ≥ 6.00 seconds 1 seconds update rate	Type B, 2 Trips
					diagnostic monitor enable	= 1 Boolean	battery voltage in range time ≥ 0.100 seconds	
					battery voltage	≥ 9.00 volts		
							run crank voltage in range time ≥ 0.100 seconds	
					run crank voltage run crank voltage in range time	≥ 9.00 volts		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Input Speed Sensor Performance	P0716	Detects unrealistic drop in raw transmission input speed signal RPM. Drop events are counted up to fail threshold. A drop event is defined by a sudden delta change in RPM from one value to a lower value. The raw transmission input speed must achieve a value high enough to record an unrealistic drop sample to sample. Once the drop threshold is met, fail time is accumualted indicating the raw transmission input speed has not recovered above a threshold, allowing the fail event count to increment. Multiple fail event counts must occur, but if the signal remains low, no further deltas occur, the "Input Speed Sensor Circuit Low Voltage" DTC will set before P0716, as P0716 is designed to set based on an intermittent raw transmission input speed signal RPM.	delta raw transmission input speed delta raw transmission input speed = raw transmission input speed - last valid raw transmission input speed, 25 millisecond update rate	≥ 2,000.0 RPM	service mode $04 active diagnostic monitor enable P0717 test fail this key on P07BF test fail this key on P07C0 test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE = FALSE	fail time ≥ 1.500 seconds updated fail event count, fail event count ≥ 5 counts, 25 millisecond update rate	Type A, 1 Trips
					last valid raw transmission input speed OR valid raw transmission input speed (before drop event)	≥ 160.0 RPM ≥ 160.0 RPM	raw transmission input speed time ≥ 2.000 seconds	
					last valid raw transmission input speed updates very 25 milliseconds when stablity time complete as long as (delta delta raw transmission input speed AND raw transmission input speed)	 ≤ 320.0 RPM > 160.0 RPM	 stability time ≥ 0.100 seconds	
					raw transmission output speed accelerator pedal position engine torque engine torque	≥ 254.0 RPM ≥ 5.0 % ≤ 8,191.9 Nm ≥ 30.0 Nm		
					transmission hydraulic pressure available: engine speed	 ≥ 400.0 RPM	 engine speed time ≥	
					DTCs not fault active	AcceleratorPedalFailure EngineTorqueEstInaccurate		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							engine speed time for transmission hydraulic pressure available	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Input Speed Sensor Circuit Low Voltage	P0717	Detects no activity in raw transmission input speed signal RPM due to open ciruit electrical failure mode or sensor internal faults, or, controller internal failure modes. The raw transmission input speed signal RPM is rationalized against vehicle conditions in which the the powertrain is producing torque available at the drive wheels, but raw transmission input speed signal RPM remains low. After a sudden drop in raw transmission input speed signal RPM, a race condition can occur between P0717 and "Input Speed Sensor Performance" depending on the true nature of the failure.	raw transmission input speed OR TISS/TOSS fault (single power supply to TISS and TOSS) = TRUE, update fail time 25 millisecond update rate	≤ 100.0 RPM < 475.0 RPM	service mode $04 active diagnostic monitor enable run crank voltage service fast learn active run crank voltage P0722 fault active P0723 fault active P077C fault active P077D fault active brake pedal position sesnor must be OBDII to use brake pedal conditional brake pedal position sesnor type brake pedal position P0716 test fail this key on P07BF test fail this key on P07C0 test fail this key on accelerator pedal position engine torque engine torque (transmission current attained gear transmission current attained gear raw transmission output speed OR transmission current attained gear transmission current attained gear raw transmission output speed) P0717 fault active P0717 test fail this key on	= FALSE = 1 Boolean ≥ 5.00 volts = FALSE ≥ 9.00 volts = FALSE = FALSE = FALSE = FALSE = CeBRKR_e_OBD < 70.0 % = FALSE = FALSE = FALSE ≥ 5.0 % ≥ 30.0 Nm ≤ 8,191.9 Nm ≤ CeCGSR_e_CR_Seventh ≥ CeCGSR_e_CR_First ≥ 162.0 RPM ≤ CeCGSR_e_CR_Tenth ≥ CeCGSR_e_CR_Seventh	fail time ≥ 4.00 seconds run crank voltage time ≥ 25 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TISS/TOSS fault (single power supply to TISS and TOSS) = TRUE occurs when: (P0722 fail time high gear exceeds fail threshold OR P0722 fail time low gear exceeds fail threshold) TISS/TOSS has single power supply calibration TISS/TOSS single power supply test enabled transmission hydraulic pressure available: engine speed DTCs not fault active	≥ 162.0 RPM = FALSE = FALSE = 0 Boolean = 1 Boolean ≥ 400.0 RPM EngineTorqueEstInaccurate	engine speed time ≥ **engine speed time for transmission hydraulic pressure available**	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Output Speed Sensor Performance	P0721	The diagnostic monitor determines if the direction TOSS value is coherent based on the on period time of the directional sensor and TOSS raw. When the on period time indicates a transitional state, the direction must also be transitional as measured by very slow TOSS raw RPM. When the on period time indicates a non-transitional state, forward or reverse, the direction must also be transition, not forward and not reverse.	TOSS raw direction when TOSS transitional period = FALSE AND TOSS raw direction when TOSS transitional period = FALSE OR TOSS raw when TOSS transitional period = TRUE update fail and sample time 6.26 millisecond update rate	≠ FORWARD ≠ REVERSE ≥ 25.0 RPM	service mode $04 active diagnostic monitor enable TOSS count sample period P0721 fault active P0721 test fail this key on TOSS transitional period detected = FALSE when: on period on period when direction unknown OR on period on period when direction is reverse OR on period on period when direction is forward TOSS transitional period detected = TRUE when: on period on period when direction unknown senor type is directional senor type cailbration	= FALSE = 1 Boolean ≠ 0 counts = FALSE = FALSE ≥ 0.4434 seconds ≤ 0.2773 seconds < 0.2363 seconds > 0.1240 seconds < 0.0811 seconds > 0.0088 seconds < 0.4434 seconds > 0.2773 seconds = CeTOSR_e_Directional	fail time ≥ 3.500 seconds out of sample time ≥ 5.000 seconds	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 Voltage	P0722	Detects no activity in raw transmission output speed signal RPM due to open ciruit electrical failure mode or sensor internal faults, or, controller internal failure modes. The raw transmission output speed signal RPM is rationalized against vehicle conditions in which the the powertrain is producing torque, but raw transmission output speed signal RPM remains low. After a sudden drop in raw transmission output speed signal RPM, a race condition can occur between P0722 and "Output Speed Sensor Circuit Intermittent" depending on the true nature of the failure.	raw transmission output speed, update fail time 6.25 millisecond update rate when: attained gear attained gear AND attained gear use high gear fail time threshold ELSE use low gear fail time threshold	≤ 30.0 RPM ≥ CeCGSR_e_CR_First ≤ CeCGSR_e_CR_Tenth > CeCGSR_e_CR_Fourth	service mode $04 active diagnostic monitor enable when neutral range occurs: (garage shift OR PRNDL OR PRNDL OR range inhibit state) AND (engine torque accelerator pedal position) when not neutral range occurs: attained gear attained gear (attained gear engine torque hysteresis high engine torque hysteresis low accelerator pedal position hysteresis high accelerator pedal position hysteresis low) when not neutral range occurs: (attained gear engine torque hysteresis high engine torque hysteresis low	= FALSE = 1 Boolean ≠ COMPLETE = PARK = NEUTRAL ≠ no inhibt active ≥ 8,192.0 Nm ≥ 100.0 % ≥ CeCGSR_e_CR_First ≤ CeCGSR_e_CR_Tenth > CeCGSR_e_CR_Fourth ≥ 50.0 Nm > 30.0 Nm ≥ 5.0 % > 3.0 % ≤ CeCGSR_e_CR_Fourth ≥ 80.0 Nm > 50.0 Nm	fail time ≥ 5.00 seconds high gear OR fail time ≥ 3.50 seconds low gear	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 hysteresis high	≥ 8.0 %		
					accelerator pedal position hysteresis low)	> 5.0 %		
					TISS enable occurs when:			
					(TISS speed select	= 1 Boolean		
					OR			
					TISS/TOSS has single power supply calibration	= 0 Boolean		
					AND			
					TISS	≤ 8,191.9 RPM		
					AND			
					TISS)	≥ 475.0 RPM		
					OR			
					(TISS speed select	≠ 1 Boolean		
					OR			
					TISS/TOSS has single power supply calibration	= 0 Boolean		
					AND			
					TISS	≤ 8,191.9 RPM		
					AND			
					TISS)	≥ 5,800.0 RPM		
					P0716 test fail this key on	= FALSE		
					P0717 test fail this key on	= FALSE		
					P07BF test fail this key on	= FALSE		
					P07C0 test fail this key on	= FALSE		
					PTO check:			
					PTO enable calibration is FALSE	≠ 1 Boolean		
					OR			
					(PTO enable calibration is TRUE	= 1 Boolean		
					AND			
					PTO active)	= TRUE		
					run crank voltage	≥ 5.00 volts	run crank voltage time ≥ 25 milliseconds	
					service fast learn active	= FALSE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					run crank voltage	≥ 9.00 volts		
					transmission fluid temperature	≥ -40.00 °C		
					P0723 test fail this key on	= FALSE		
					P077C test fail this key on	= FALSE		
					P077D test fail this key on	= FALSE		
					P0722 fault active	= FALSE		
					P0722 test fail this key on	= FALSE		
					transmission hydraulic pressure available:			
					engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available**	
					DTCs not fault active	AcceleratorPedalFailure EngineTorqueEstInaccurate		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Output Speed Sensor Circuit Intermittent	P0723	Detects unrealistic drop in raw transmission output speed signal RPM. Drop events are counted up to fail threshold. A drop event is defined by a sudden delta change in RPM from one value to a lower value. The raw transmission output speed must achieve a value high enough to record an unrealistic drop sample to sample. Once the drop threshold is met, fail time is accumualted indicating the raw transmission output speed has not recovered above a threshold, allowing the fail event count to increment. Multiple fail event counts must occur, but if the signal remains low, no further deltas occur, the "Output Speed Sensor Circuit Low Voltage" DTC will set before P0723, as P0723 is designed to set based on an intermittent raw transmission output speed signal RPM.	4WD low fail threshold: delta raw transmission output speed OR NOT 4WD low fail threshold, update fail time, delta raw transmission output speed = raw transmission output speed previous loop - raw transmission output speed, 25 millisecond update rate	≥ 700.0 RPM ≥ 700.0 RPM	service mode $04 active diagnostic monitor enable transmission engaged state 4WD low state PTO check: PTO enable calibration is FALSE OR (PTO enable calibration is TRUE AND PTO active) run crank voltage service fast learn active run crank voltage P077C test fail this key on P077D test fail this key on when PRNDL is moved to	= FALSE = 1 Boolean ≠ not engaged = 4WD low state previous loop, 25 millisecond update rate ≠ 1 Boolean = 1 Boolean = TRUE ≥ 5.00 volts = FALSE ≥ 9.00 volts = FALSE = FALSE	fail time ≥ 1.500 seconds updated fail event count, fail event count ≥ 5 counts, 25 millisecond update rate transmission engaged state time ≥ **P0723 transmission engaged state time threshold** 4WD low change time ≥ 3.0 seconds run crank voltage time ≥ 25 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					NEUTRAL allow transmission engaged state time before enabling fail evaluation, or, if raw raw transmission output speed is active in NEUTRAL enable fail evaluation:			
					PRNDL OR	= CeTRGR_e_PRNDL_Neutral		
					PRNDL OR	= CeTRGR_e_PRNDL_Transitional1 N-D transitional		
					PRNDL OR	= CeTRGR_e_PRNDL_Transitional4 R-N transitional		
					raw transmission output speed OR	≥ 250.0 RPM		
					last valid raw transmission output speed	≥ 250.0 RPM		
					determine if raw transmission input speed is stable:			
					(raw transmission input speed - raw transmission input speed previous, 25 millisecond update AND	≤ 4,095.9 RPM	raw transmission input speed stability time ≥ 2.00 seconds	
					raw transmission input speed) OR	≥ 160.0 RPM		
					(TISS/TOSS has single power supply calibration AND	= 0 Boolean	no time required	
					raw transmission input speed)	= 0.0 RPM		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					select delta RPM fail theshold: (4WD low state AND $WD low valid) select P0723 4WD TOSS delta fail threshold otherwise use P0723 TOSS delta fail threshold last valid raw transmission output speed OR valid raw transmission output speed (before drop event) last valid raw transmission output speed updates very 25 milliseconds when stablity time complete as long as (delta delta raw transmission output speed AND raw transmission output speed) transmission hydraulic pressure available: engine speed DTCs not fault active	 = TRUE = TRUE > 89.0 RPM > 89.0 RPM ≤ 140.0 RPM ≥ 89.0 RPM ≥ 400.0 RPM AcceleratorPedalFailure EngineTorqueEstInaccurate	raw transmission output speed time ≥ 2.00 seconds stability time ≥ 0.100 seconds engine speed time ≥ **engine speed time for transmission hydraulic pressure available**	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid A Stuck Off	P0746	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. In the failure mode the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line	C1 clutch slip speed, update fail time 6.25 milliscond update	≥ 200.0 RPM			fail time ≥ 3.00 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update	Type A, 1 Trips
					use battery voltage calibration is FALSE	= 1 Boolean		
					OR			
					(use battery voltage calibration is TRUE	= 1 Boolean		
					AND			
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					use run crank voltage calibration is FALSE	= 0 Boolean		
					OR			
					(use run crank voltage calibration is TRUE	= 0 Boolean		
					AND			
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure control, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch pressure control solenoid is failed hydraulically off, the clutch does not maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed in the opposite sense, clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional, which must take priority over any clutch pressure control solenoid stuck off diagnostic monitor. All clutch pressure control			available: engine speed enable C1 clutch slip speed fail compare when: diagnostic clutch test C1 ((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) unintended deceleration fault pending OR unintended deceleration fault pending enable FASLE (startle mitigation) clutch steady state adaptive active transmission output shaft speed C1 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation accelerator pedal position engine speed diagnostic clutch test C1 set to HOLDING CLUTCH when: clutch solenoid test state	 ≥ 400.0 RPM = HOLDING CLUTCH = FALSE = TRUE ≠ initial startle mitigation gear = FALSE = 0 Boolean = FALSE ≥ 89.0 RPM = TRUE ≥ 2.00 % ≥ 1,500.0 RPM = NEUTRAL TEST	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 C1 CB123456, or, GR10 C1 CB123456R, clutch pressure control solenoid.			((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) C1 clutch pressured map clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on	= FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, C1 clutch pressure has transtioned from off-applying-applied = TRUE ≠ range shift completed = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed	initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					failure modes, the clutch pressure control solenoid stuck on DTCs being P0747 P0777 P0797 P2715 P2724 P2733 P2821			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid A Stuck On	P0747	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C1 clutch slip speed OR shift type is not power down shift, C1 clutch slip speed update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM			shift type is power down shift, fail time ≥ 0.800 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update	Type A, 1 Trips
					use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage	= 1 Boolean = 1 Boolean ≥ 9.00 volts	 battery voltage time ≥ 0.100 seconds	
					use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage	= 0 Boolean = 0 Boolean ≥ 9.00 volts	 run crank voltage time ≥ 0.100 seconds	
					TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the pressure control solenoid stuck on diagnostic monitor, the safety startle mitigation function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional. All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled service fast learn active service solenoid cleaning procedure active hydraulic pressure available: engine speed transmission output shaft speed set solenoid stuck on test trigger to TRUE when: clutch pressure control solenoid stuck off stuck intrusive shift request startle mitigation active (see startle mitigation active NOTE below) clutch control solenoid test state clutch control solenoid test state (see clutch control solenoid test state NOTE below) initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE Boolean = FALSE Boolean = FALSE Boolean ≥ 400.0 RPM ≥ 89.0 RPM = FALSE = FALSE ≠ TIE UP TEST TEST STATE ≠ TIE UP TEST HOLD = TRUE	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C1 CB123456, or, GR10 C1 CB123456R, clutch pressure control solenoid.			and off for auto trans shift)			
					(shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift	= 0 Boolean		
					OR			
					shift type enable for garage shift	= 0 Boolean		
					OR			
					shift type enable for negative torque up shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power on up shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle down shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power down shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle lift foot up shift)	= 0 Boolean		
					OR			
					clutch control solenoid test state	= TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					transition clutch controller	= TRUE		
					active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift)	≠ staged steady state		
					set clutch control solenoid test state to TIE UP TEST			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when:			
					solenoid stuck on test trigger	= TRUE		
					current loop clutch control solenoid test state OR	= TEST WAITING		
					current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					range shift state	≠ range shift complete		
					solenoid stuck on test trigger	= TRUE		
					additional off going clutch occured	= TRUE		
					(clutch control solenoid test state OR	= TIE UP TEST TEST STATE		
					clutch control solenoid test state) (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					diagnostic clutch test	= OFF GOING CLUTCH TEST		
					(C1 off going clutch pressure control ramp time out complete AND	= TRUE		
					off going clutch pressure ramp control ramp time out enable) OR	= 1 Boolean		
					C1 off going clutch pressure	≤ 350.0 kPa	for C1 off going clutch pressure time ≥ **P0747 C1 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							P0747 C1 clutch exhaust delay time open throttle power on up shift OR **P0747 C1 clutch exhaust delay time garage shift** OR **P0747 C1 clutch exhaust delay time closed throttle down shift** OR **P0747 C1 clutch exhaust delay time negative torque up shift** OR **P0747 C1 clutch exhaust delay time open throttle power down shift** see supporting tables	
					engine torque	≥ 8,191.8 Nm		
					primary on coming clutch active	= TRUE		
					primary on coming control state	≠ clutch fill phase		
					closed throttle lift foot up shift primary on coming clutch pressure	≥ 690.0 kPa		
					OR			
					open throttle power on up shift primary on coming clutch pressure	≥ 2,100.0 kPA		
					OR			
					garage shift primary on	≥ 750.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 690.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 400.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 690.0 kPa		
					C1 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid B Stuck Off	P0776	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. In the failure mode the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line	C1 clutch slip speed, update fail time 6.25 milliscond update	≥ 200.0 RPM			fail time ≥ 3.00 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update	Type A, 1 Trips
					use battery voltage calibration is FALSE	= 1 Boolean		
					OR			
					(use battery voltage calibration is TRUE	= 1 Boolean		
					AND			
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					use run crank voltage calibration is FALSE	= 0 Boolean		
					OR			
					(use run crank voltage calibration is TRUE	= 0 Boolean		
					AND			
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure control, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch pressure control solenoid is failed hydraulically off, the clutch does not maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed in the opposite sense, clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional, which must take priority over any clutch pressure control solenoid stuck off diagnostic monitor. All clutch pressure control			available: engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
					enable C2 clutch slip speed fail compare when: diagnostic clutch test C2	= HOLDING CLUTCH		
					((startle mitigation active OR	= FALSE		
					(startle mitigation active AND	= TRUE		
					startle mitigation gear)) (see startle mitigation active NOTE below)	≠ initial startle mitigation gear		
					unintended deceleration fault pending OR	= FALSE		
					unintended deceleration fault pending enable FASLE (startle mitigation)	= 0 Boolean		
					clutch steady state adaptive active	= FALSE		
					transmission output shaft speed	≥ 89.0 RPM		
					C2 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					accelerator pedal position	≥ 2.00 %		
					engine speed	≥ 1,500.0 RPM		
					diagnostic clutch test C2 set to HOLDING CLUTCH when:			
					clutch solenoid test state	= NEUTRAL TEST		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 C2 CB29 or GR10 C2 CB128910R, clutch pressure control solenoid.			((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) C2 clutch pressured map clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on	= FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, C2 clutch pressure has transtioned from off-applying-applied = TRUE ≠ range shift completed = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed	initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					failure modes, the clutch pressure control solenoid stuck on DTCs being P0747 P0777 P0797 P2715 P2724 P2733 P2821			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid B Stuck On	P0777	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C2 clutch slip speed OR shift type is not power down shift, C2 clutch slip speed update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean	shift type is power down shift, fail time ≥ 0.800 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the pressure control solenoid stuck on diagnostic monitor, the safety startle mitigation function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional. All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure available: engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
					transmission output shaft speed	≥ 89.0 RPM		
					set solenoid stuck on test trigger to TRUE when:			
					clutch pressure control solenoid stuck off stuck intrusive shift request	= FALSE		
					startle mitigation active (see startle mitigation active NOTE below)	= FALSE		
					clutch control solenoid test state	≠ TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	≠ TIE UP TEST HOLD		
					initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C2 CB29 or GR10 C2 CB128910R, clutch pressure control solenoid.			and off for auto trans shift)			
					(shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift OR	= 0 Boolean		
					shift type enable for garage shift OR	= 0 Boolean		
					shift type enable for negative torque up shift OR	= 1 Boolean		
					shift type enable for open throttle power on up shift OR	= 1 Boolean		
					shift type enable for closed throttle down shift OR	= 1 Boolean		
					shift type enable for open throttle power down shift OR	= 1 Boolean		
					shift type enable for closed throttle lift foot up shift) OR	= 0 Boolean		
					clutch control solenoid test state	= TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					transition clutch controller	= TRUE		
					active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift)	≠ staged steady state		
					set clutch control solenoid test state to TIE UP TEST			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when:			
					solenoid stuck on test trigger	= TRUE		
					current loop clutch control solenoid test state OR	= TEST WAITING		
					current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					range shift state	≠ range shift complete		
					solenoid stuck on test trigger	= TRUE		
					additional off going clutch occured	= TRUE		
					(clutch control solenoid test state OR	= TIE UP TEST TEST STATE		
					clutch control solenoid test state) (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					diagnostic clutch test	= OFF GOING CLUTCH TEST		
					(C2 off going clutch pressure control ramp time out complete AND	= TRUE		
					off going clutch pressure ramp control ramp time out enable) OR	= 1 Boolean		
					C2 off going clutch pressure	≤ 350.0 kPa	for C2 off going clutch pressure time ≥ **P0777 C2 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							P0777 C2 clutch exhaust delay time open throttle power on up shift OR **P0777 C2 clutch exhaust delay time garage shift** OR **P0777 C2 clutch exhaust delay time closed throttle down shift** OR **P0777 C2 clutch exhaust delay time negative torque up shift** OR **P0777 C2 clutch exhaust delay time open throttle power down shift** see supporting tables	
					engine torque	≥ 8,191.8 Nm		
					primary on coming clutch active	= TRUE		
					primary on coming control state	≠ clutch fill phase		
					closed throttle lift foot up shift primary on coming clutch pressure OR	≥ 800.0 kPa		
					open throttle power on up shift primary on coming clutch pressure OR	≥ 800.0 kPA		
					garage shift primary on	≥ 750.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 800.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 800.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 800.0 kPa		
					C2 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

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	Controller specific analog circuit diagnoses the transmission output speed sensor and wiring for a short to ground fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission output speed sesnor raw voltage, update fail time, 12.5 millisecond update rate	≤ 0.2500 volts (≤ 0.5 Ω impedance between signal and controller ground)	service mode $04 active diagnostic monitor enable P077D fault active service fast learn run crank voltage battery voltage P077C fault active P077C test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE ≥ 10.00 volts ≥ 10.00 volts = FALSE = FALSE	fail time ≥ 0.050 seconds, update fail count 12.5 millisecond update rate fail count ≥ 16 counts 12.5 millisecond update rate run crank and battery voltage time ≥ 5.000 seconds	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	Controller specific analog circuit diagnoses the transmission output speed sensor and wiring for a short to voltage fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission output speed sesnor raw voltage, update fail time, 12.5 millisecond update rate	≥ 4.7500 volts (≤ 0.5 Ω impedance between signal and controller power)	service mode $04 active diagnostic monitor enable P077C fault active service fast learn run crank voltage battery voltage P077D fault active P077D test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE ≥ 10.00 volts ≥ 10.00 volts = FALSE = FALSE	fail time ≥ 0.050 seconds, update fail count 12.5 millisecond update rate fail count ≥ 16 counts 12.5 millisecond update rate run crank and battery voltage time ≥ 5.000 seconds	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 Stuck Off	P0796	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. In the failure mode the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line	C1 clutch slip speed, update fail time 6.25 milliscond update	≥ 200.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled service fast learn active service solenoid cleaning procedure active hydraulic pressure	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean = TRUE Boolean = FALSE Boolean = FALSE Boolean	fail time ≥ 3.00 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 seconds	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, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch pressure control solenoid is failed hydraulically off, the clutch does not maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed in the opposite sense, clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional, which must take priority over any clutch pressure control solenoid stuck off diagnostic monitor. All clutch pressure control			available: engine speed	 ≥ 400.0 RPM	 engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
					enable C3 clutch slip speed fail compare when: diagnostic clutch test C3 ((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) unintended deceleration fault pending OR unintended deceleration fault pending enable FASLE (startle mitigation) clutch steady state adaptive active transmission output shaft speed C3 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	 = HOLDING CLUTCH = FALSE = TRUE ≠ initial startle mitigation gear = FALSE = 0 Boolean = FALSE ≥ 89.0 RPM = TRUE		
					accelerator pedal position engine speed	≥ 2.00 % ≥ 1,500.0 RPM		
					diagnostic clutch test C3 set to HOLDING CLUTCH when: clutch solenoid test state	 = NEUTRAL TEST		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 C3 CB38, or, GR10 C3 CB123456R, clutch pressure control solenoid.			((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) C3 clutch pressured map clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on	= FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, C3 clutch pressure has transtioned from off-applying-applied = TRUE ≠ range shift completed = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed	initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					failure modes, the clutch pressure control solenoid stuck on DTCs being P0747 P0777 P0797 P2715 P2724 P2733 P2821			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid C Stuck On	P0797	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C3 clutch slip speed OR shift type is not power down shift, C3 clutch slip speed update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean	shift type is power down shift, fail time ≥ 0.800 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the pressure control solenoid stuck on diagnostic monitor, the safety startle mitigation function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional. All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure available: engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
					transmission output shaft speed	≥ 89.0 RPM		
					set solenoid stuck on test trigger to TRUE when: clutch pressure control solenoid stuck off stuck intrusive shift request	= FALSE		
					startle mitigation active (see startle mitigation active NOTE below)	= FALSE		
					clutch control solenoid test state	≠ TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	≠ TIE UP TEST HOLD		
					initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C3 CB38, or, GR10 C3 CB123456R, clutch pressure control solenoid.			and off for auto trans shift) (shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift OR shift type enable for garage shift OR shift type enable for negative torque up shift OR shift type enable for open throttle power on up shift OR shift type enable for closed throttle down shift OR shift type enable for open throttle power down shift OR shift type enable for closed throttle lift foot up shift) OR clutch control solenoid test state clutch control solenoid test state (see clutch control solenoid test state NOTE below) transition clutch controller active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift) set clutch control solenoid test state to TIE UP TEST	 = 0 Boolean = 0 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 0 Boolean = TIE UP TEST TEST STATE = TIE UP TEST HOLD = TRUE ≠ staged steady state		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when: solenoid stuck on test trigger current loop clutch control solenoid test state OR current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below) range shift state solenoid stuck on test trigger additional off going clutch occured (clutch control solenoid test state OR clutch control solenoid test state) (see clutch control solenoid test state NOTE below) diagnostic clutch test (C3 off going clutch pressure control ramp time out complete AND off going clutch pressure ramp control ramp time out enable) OR C3 off going clutch pressure	 = TRUE = TEST WAITING = TIE UP TEST HOLD ≠ range shift complete = TRUE = TRUE = TIE UP TEST TEST STATE = TIE UP TEST HOLD = OFF GOING CLUTCH TEST = TRUE = 1 Boolean ≤ 350.0 kPa	for C3 off going clutch pressure time ≥ **P0797 C3 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							P0797 C3 clutch exhaust delay time open throttle power on up shift OR **P0797 C3clutch exhaust delay time garage shift** OR **P0797 C3 clutch exhaust delay time closed throttle down shift** OR **P0797 C3 clutch exhaust delay time negative torque up shift** OR **P0797 C3 clutch exhaust delay time open throttle power down shift** see supporting tables	
					engine torque	≥ 8,191.8 Nm		
					primary on coming clutch active	= TRUE		
					primary on coming control state	≠ clutch fill phase		
					closed throttle lift foot up shift primary on coming clutch pressure OR	≥ 500.0 kPa		
					open throttle power on up shift primary on coming clutch pressure OR	≥ 500.0 kPA		
					garage shift primary on	≥ 750.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 500.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 500.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 500.0 kPa		
					C3 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Input/Turbine Speed Sensor A Circuit Low	P07BF	Controller specific analog circuit diagnoses the transmission input/ turbine speed sensor and wiring for a short to ground fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission intput/turbine speed sesnor raw voltage, update fail time, 12.5 millisecond update rate	≤ 0.2500 volts (≤ 0.5 Ω impedance between signal and controller ground)	service mode $04 active diagnostic monitor enable P07C0 fault active service fast learn run crank voltage battery voltage P07BF fault active P07BF test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE ≥ 10.00 volts ≥ 10.00 volts = FALSE = FALSE	fail time ≥ 0.050 seconds, update fail count 12.5 millisecond update rate fail count ≥ 16 counts 12.5 millisecond update rate run crank and battery voltage time ≥ 5.000 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Input/Turbine Speed Sensor A Circuit High	P07C0	Controller specific analog circuit diagnoses the transmission input/ turbine speed sensor and wiring for a short to voltage fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission input/turbine speed sesnor raw voltage, update fail time, 12.5 millisecond update rate	≥ 4.7500 volts (≤ 0.5 Ω impedance between signal and controller power)	service mode $04 active diagnostic monitor enable P07BF fault active service fast learn run crank voltage battery voltage P07C0 fault active P07C0 test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE ≥ 10.00 volts ≥ 10.00 volts = FALSE = FALSE	fail time ≥ 0.050 seconds, update fail count 12.5 millisecond update rate fail count ≥ 16 counts 12.5 millisecond update rate run crank and battery voltage time ≥ 5.000 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Upshift Switch Circuit	P0815	Diagnoses the state of the upshift switch circuit, stuck in the state "tap up" (upshift) active.	switch state update fail time 1 100 millisecond update rate	= tap up (upshift) state active	service mode $04 active diagnostic monitor enable run crank voltage run crank voltage P1761 fault active P0826 fault active P0826 test fail this key on P0826 fault pending (P0815 fault active OR P0815 fault active test fail this key on) PRNDL range change time PRNDL in range: D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9 OR D10 OR NEUTRAL OR PARK OR REVERSE DTCs not fault pending	= FALSE = 1 Boolean ≥ 5.00 volts ≥ 9.00 volts = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 0 Boolean = 0 Boolean = 0 Boolean = 0 Boolean Transmission Shift Lever Position Validity	fail time 1 ≥ 1.00 seconds run crank voltage time ≥ 25 milliseconds ≥ 1.00 seconds	Emissions Neutral Diagnostic – Type C
			switch state update fail time 2 100 millisecond update rate	= tap up (upshift) state active	service mode $04 active diagnostic monitor enable run crank voltage run crank voltage P1761 fault active P0826 fault active P0826 test fail this key on	= FALSE = 1 Boolean ≥ 5.00 volts ≥ 9.00 volts = FALSE = FALSE = FALSE	fail time 2 ≥ 120.00 seconds run crank voltage time ≥ 25 milliseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P0826 fault pending	= FALSE		
					(P0815 fault active OR	= FALSE		
					P0815 fault active test fail this key on)	= FALSE		
					PRNDL range change time		≥ 1.00 seconds	
					PRNDL in range:			
					D1 OR	= 1 Boolean		
					D2 OR	= 1 Boolean		
					D3 OR	= 1 Boolean		
					D4 OR	= 1 Boolean		
					D5 OR	= 1 Boolean		
					D6 OR	= 1 Boolean		
					D7 OR	= 1 Boolean		
					D8 OR	= 1 Boolean		
					D9 OR	= 1 Boolean		
					D10 OR	= 0 Boolean		
					NEUTRAL OR	= 0 Boolean		
					PARK OR	= 0 Boolean		
					REVERSE	= 0 Boolean		
					DTCs not fault pending	Transmission Shift Lever Position Validity		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Downshift Switch Circuit	P0816	Diagnoses the state of the downshift switch circuit, stuck in the state "tap down" (downshift) active.	switch state update fail time 1 100 millisecond update rate	= tap down (downshift) state active	service mode $04 active diagnostic monitor enable run crank voltage run crank voltage P1761 fault active P0826 fault active P0826 test fail this key on P0826 fault pending (P0816 fault active OR P0816 fault active test fail this key on) PRNDL range change time PRNDL in range: D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9 OR D10 OR NEUTRAL OR PARK OR REVERSE DTCs not fault pending	= FALSE = 1 Boolean ≥ 5.00 volts ≥ 9.00 volts = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 0 Boolean = 0 Boolean = 0 Boolean = 0 Boolean Transmission Shift Lever Position Validity	fail time 1 ≥ 1.00 seconds run crank voltage time ≥ 25 milliseconds ≥ 1.00 seconds	Emissions Neutral Diagnostic – Type C
			switch state update fail time 2 100 millisecond update rate	= tap down (downshift) state active	service mode $04 active diagnostic monitor enable run crank voltage run crank voltage P1761 fault active P0826 fault active P0826 test fail this key on	= FALSE = 1 Boolean ≥ 5.00 volts ≥ 9.00 volts = FALSE = FALSE = FALSE	fail time 2 ≥ 120.00 seconds run crank voltage time ≥ 25 milliseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P0826 fault pending (P0816 fault active OR P0816 fault active test fail this key on) PRNDL range change time PRNDL in range: D1 OR D2 OR D3 OR D4 OR D5 OR D6 OR D7 OR D8 OR D9 OR D10 OR NEUTRAL OR PARK OR REVERSE DTCs not fault pending	= FALSE = FALSE = FALSE = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 0 Boolean = 0 Boolean = 0 Boolean = 0 Boolean Transmission Shift Lever Position Validity	≥ 1.00 seconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Up and Down Shift Switch Circuit	P0826	Diagnoses the state of the upshift/downshift switch circuit at an illegal voltage, voltage out of range.	switch state update fail time 100 millisecond update rate	= illegal (voltage out of range)	service mode $04 active diagnostic monitor enable run crank voltage run crank voltage P1761 fault active (P0826 fault active OR P0826 fault active test fail this key on)	= FALSE = 1 Boolean ≥ 5.00 volts ≥ 9.00 volts = FALSE = FALSE = FALSE	fail time ≥ 60.00 seconds run crank voltage time ≥ 25 milliseconds	Emissions Neutral Diagnostic – Type C

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	Controller specific circuit diagnoses 9 speed CB123456 or 10 speed CB123456R clutch solenoid for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	Controller specific circuit diagnoses 9 speed CB123456 or 10 speed CB123456R clutch solenoid for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	Controller specific circuit diagnoses 9 speed CB123456 or 10 speed CB123456R clutch solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	Controller specific circuit diagnoses 9 speed CB29 or 10 speed CB128910R clutch solenoid for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Low Voltage	P0966	Controller specific circuit diagnoses 9 speed CB123456 or 10 speed CB123456R clutch solenoid for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	Controller specific circuit diagnoses 9 speed CB123456 or 10 speed CB123456R clutch solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	Controller specific circuit diagnoses 9 speed CB38 or 10 speed C23457910 clutch solenoid for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	Controller specific circuit diagnoses 9 speed CB38 or 10 speed C23457910 clutch solenoid for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 High Voltage	P0971	Controller specific circuit diagnoses 9 speed CB38 or 10 speed C23457910 clutch solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	100 / 16 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	8 / 16 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	P16F3	The diagnostic monitor is a rationalization of command values: command clutch pressures and command gear. The monitor is broken up into two fault detection routines, command pressure (tie up) fault detection and command gear/shift fault detection. The command pressure (tie up) fault detection is designed to verify the number of clutches applied in a given gear state is limited, in order to prevent a transmission internal mechanical tie-up condition. A condition which could lead to a vehicle deceleration above the design safety metric. If commanded clutch pressures are above a threshold which would allow multiple clutches to carry torque, the clutch is considered applied, otherwise the clutch is considered released. If there are more clutches applied, via the commanded clutch pressures, in a given gear state than is rational, one or more of	command pressure (tie up) fault detection minimum # of clutches ON by attained gear and by comanded gear, take lower of the 2 values, where attained gear is the current operating gear and command gear is the targetted value to transtion toward see **9 speed transmission clutch definition and gear state to clutch map** and **10 speed transmission clutch definition and gear state to clutch map** attached supporting tables for clutch 1 through clutch 7 definition and gear state to clutch map	≤ **NumClchTieUp** See Attached Supporting Tables	Reduandant Memory Command Pressure Enable Calibraiton Not	= 0 Boolean	single event 6.25 millisecond update rate	Type A, 1 Trips
					Reduandant Memory Command Pressure Enable Calibraiton	= 1 Boolean		
					No traction event in progress: ABS((driven wheel speed - non-drive wheel speed) / driven wheel speed)	≥ 0.00 %		
					25 millisecond derivative TOSS RPM, (TOSS delta 25 millisecond loop to 25 milsecond loop) / 25 millisecond	< 0.750 * **P2D2 Cltch Slip Sum** see attached supporting Table		
					for time	≥ 0.0500 seconds		
					Clutch 1 hydraulic volume fill factor	≥ 1.000 unitless		
					Clutch 2 hydraulic volume fill factor	≥ 1.000 unitless		
					Clutch 3 hydraulic volume fill factor	≥ 1.000 unitless		
					Clutch 4 hydraulic volume fill factor	≥ 1.000 unitless		
					Clutch 5 hydraulic volume fill factor	≥ 1.000 unitless		
					Clutch 6 hydraulic volume fill factor	≥ 1.000 unitless		
					Clutch 7 hydraulic volume fill factor	≥ 1.000 unitless		
					when clutch is off going (releasing) clutch the commanded clutch pressure equation = ((pressure control solenoid command			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		the clutch pressure command values are in error. Given rate of change of transmission output shaft speed, command gear state clutches and clutch hydraulic fill volumes, those clutches in transition from the hydraulic released state to the hydraulic applied state and from the hydraulic applied state to the hydraulic released state, the rationality detects any number of command clutch pressures above a threshold, that are simultaneously active to cause a vehicle deceleration above the design safety metric. The command gear/ shift fault detection is designed to verify the commanded gear will not induce a downshift resulting in a gear state that is erroneous given vehicle operating conditions. The detection rationalizes the command gear against a minimum gear, highest gear ratio, for given vehicle speed and driver accelerator position.			pressure - pressure offset) * regulator valve gain) - regulator valve return spring pressure adaptive when clutch 1 is off going clutch: clutch 1 command pressure clutch 1 state is OFF when: clutch 1 command pressure, else clutch is ON and count clutch 1 toward minimum # of clutches ON when clutch 2 is off going clutch: clutch 2 command pressure clutch 2 state is OFF when: clutch 2 command pressure, else clutch is ON and count clutch 2 toward minimum # of clutches ON when clutch 3 is off going clutch: clutch 3 command pressure	= ((clutch 1 pressure control solenoid command pressure - 0.00) * 1.00) - regulator valve return spring pressure adaptive, kPa **P2D2 Decel Pressure - ≤ C1** see attached supporting tables = ((clutch 2 pressure control solenoid command pressure - 0.00) * 1.00) - regulator valve return spring pressure adaptive, kPa **P2D2 Decel Pressure - ≤ C2** see attached supporting tables = ((clutch 3 pressure		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					clutch 3 state is OFF when: clutch 3 command pressure, else clutch is ON and count clutch 3 toward minimum # of clutches ON when clutch 4 is off going clutch: clutch 4 command pressure clutch 4 state is OFF when: clutch 4 command pressure, else clutch is ON and count clutch 4 toward minimum # of clutches ON when clutch 5 is off going clutch: clutch 5 command pressure clutch 5 state is OFF when: clutch 5 command pressure,	control solenoid command pressure - 177.00) * 1.51) - regulator valve return spring pressure adaptive, kPa **P2D2 Decel Pressure - ≤ C3** see attached supporting tables = ((clutch 4 pressure control solenoid command pressure - 160.00) * 2.25) - regulator valve return spring pressure adaptive, kPa **P2D2 Decel Pressure - ≤ C4** see attached supporting tables = ((clutch 5 pressure control solenoid command pressure - 0.00) * 1.00) - regulator valve return spring pressure adaptive, kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					else clutch is ON and count clutch 5 toward minimum # of clutches ON	**P2D2 Decel Pressure - ≤ C5** see attached supporting tables		
					when clutch 6 is off going clutch: clutch 6 command pressure	= ((clutch 6 pressure control solenoid command pressure - 0.00) * 1.00) - regulator valve return spring pressure adaptive, kPa		
					clutch 6 state is OFF when: clutch 6 command pressure, else clutch is ON and count clutch 6 toward minimum # of clutches ON	**P2D2 Decel Pressure - ≤ C6** see attached supporting tables		
					when clutch 7 is off going clutch: clutch 7 command pressure	= ((clutch 7 pressure control solenoid command pressure - 0.00) * 1.00) - regulator valve return spring pressure adaptive, kPa		
					clutch 7 state is OFF when: clutch 7 command pressure, else clutch is ON and count clutch 7 toward minimum # of clutches ON	**P2D2 Decel Pressure - ≤ C7** see attached supporting tables		
					service fast learn not active			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					no speed sensor DTCs fault active: P0716, P0717, P0721, P0722, P0723, P077C, P077D, P07BF, P07C0, P172A, P172B, P176B, P176C, P176D, P1783, P178F, P17C4, P17C5, P17C6, P17CC, P17CD, P17CE, P17D3, P17D6 no high side driver DTCs fault active: P0658, P2670			
			command gear/shift fault detection 1st gear commanded and vehicle seed OR 2nd gear commanded and vehicle seed OR 3rd gear commanded and vehicle seed OR 4th gear commanded and vehicle seed OR 5th gear commanded and vehicle seed OR 6th gear commanded and vehicle seed OR 7th gear commanded and vehicle seed OR 8th gear commanded and	 > 57.24 KPH > 81.18 KPH > 89.10 KPH > 109.72 KPH > 139.56 KPH > 185.60 KPH > 268.38 KPH	Reduandant Memory Command Gear Enable Calibraiton Not Reduandant Memory Command Gear Enable Calibraiton service fast learn not active no speed sensor DTCs fault active: P0716, P0717, P0721, P0722, P0723, P077C, P077D, P07BF, P07C0, P172A, P172B, P176B, P176C, P176D, P1783, P178F, P17C4, P17C5, P17C6, P17CC, P17CD, P17CE, P17D3, P17D6 no high side driver DTCs fault active:	= 0 Boolean = 1 Boolean	command gear fail event count ≥ 3 counts 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			vehicle seed OR 9th gear commanded and vehicle seed OR 10th gear commanded and vehicle seed THEN increment command gear fail event count and abort commanded gear and delay for time before next fail evaluation	> 359.27 KPH > 434.97 KPH > 434.97 KPH > 5.00 seconds	P0658, P2670			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Speed Signal Analog to Digital Converter Performance	P16FB	The diagnostic monitor validates the controller calculated transmission output speed sensor data parameters, calculated in multiple paths/subroutines and at different rates. There are multiple transmission output speed sensor data parameters, calculated at rates of 6.25 milliseconds, 12.5 milliseconds and 25 milliseconds. While the same subroutine, a generic “calculate TOSS” is called from different time loops, each call stores that current value of the calculated TOSS to a different memory location. For example, a 12.5 millisecond loop calling “calculate TOSS” stores the calculated TOSS value to a “12.5 millisecond TOSS calculated” data parameter in memory, while a 25 millisecond loop calling “calculate TOSS” stores the calculated TOSS value to a “25 millisecond TOSS calculated” data parameter in memory. The raw transmission output speed sensor	ABS(raw transmission output speed, 6.25 millisecond data parameter - raw transmission output speed, 25 millisecond data parameter) update fail and sample time 25 millisecond update rate	≥ 60.0 RPM	service mode $04 active diagnsotic monitor enable raw transmission output speed, 25 millisecond data parameter raw transmission output speed, 6.25 millisecond data parameter run crank voltage battery voltage	= FALSE = 1 Boolean ≥ 356.0 RPM ≥ 356.0 RPM ≥ 10.00 volts ≥ 10.00 volts	fail time ≥ 8.000 seconds out of sample time ≥ 10.000 seconds 25 millisecond update rate run crank and battery voltage time ≥ 5.000 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		signal is diagnosed independently electrically and for performance of this DTC. The transmission output speed sensor data parameters that are calculated at different rates must always be within a negligible difference of each other.						

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit Low	P171B	Controller specific transmission surge accumulator control circuit diagnoses the transmission surge accumulator and wiring for a ground short circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage battery voltage battery enable time run/crank voltage run crank voltage time ≥ diagnostic monitor enable	≥ 9.00 volts ≤ 32.00 volts ≥ 1.00 seconds ≥ 5.00 volts 25 milliseconds = 1 Boolean	fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Solenoid Circuit High	P171C	Controller specific transmission surge accumulator control circuit diagnoses the transmission surge accumulator and wiring for a short to voltage circuit fault by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage battery voltage battery voltage enable time run/crank voltage run crank voltage time diagnostic monitor enable	≥ 9.00 volts ≤ 32.00 volts ≥ 1.00 seconds ≥ 5.00 volts time ≥ 25 milliseconds = 1 Boolean	fail time ≥ 0.300 seconds out of ≥ 0.500 seconds sample time	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Surge Accumulator System Performance	P171D	Detects when the surge accumulator system, used to provide transmission hydraulic pressure, is not capable of supplying adequate hydraulic pressure during an engine auto-start. The transmission holding clutch pressures are commanded to meet the engine crank shaft torque output, to prevent clutch slip to those holding clutches, during the engine auto-start. The diagnostic monitors transmission input shaft speed during the auto-start event as the primary malfunction criteria. Measured input shaft speed that is excessive is an indication the holding clutches are slipping due to inadequate hydraulic pressure, as a result of a failed surge accumulator system.	Transmission turbine speed is greater than predicted turbine speed during autostart event, update initial fail count	**P171D predicted ≥ turbine speed error** Refer to "Transmission Supporting Tables" for details	PRNDL state defaulted Transmission shift lever position Propulsion system active Ignition voltage Ignition voltage Transmission fluid temp Transmission fluid temp Hybrid state AutoStop duration min During autostop Engine speed was **************************** If above conditions are met then the following must occur: Turbine speed Engine speed Hydraulic pressure delay time If above conditions are met then increment time-out timer. Time-out timer Note: The initial fail	= False = Forward range A = True > 9.00 volts < 31.99 volts > 0.00 °C < 110.00 °C = Engine off ≥ 1.200 seconds < 5.0 RPM ≥ 80.0 RPM ≥ 450.0 RPM **P171D hydraulic ≥ pressure delay** Refer to "Transmission Supporting Tables" for details ≤ 0.38 seconds	≥ 8 counts (initial fail count) Frequency =12.5ms Once the above counts are achieved then increment the final fail counter once. The final fail counter can only increment once per autostart event ≥ 3 counts (final fail counter) If above counter is greater than threshold then report DTC failed. Frequency = 12.5ms	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					counter must achieve it's fail threshold in less than the time-out time. **************************** If vehicle is launched then: Transmission gear ratio Trans 1st gear ratio Trans 1st gear ratio Trans gear ratio not 1st gear Trans gear ratio not 1st gear Valid transmission gear ratio achieved time OR If vehicle is not launched but autostart occurs then: Turbine speed Turbine speed less then above threshold for Note: During an autostart event the lack of hydraulic pressure will result in momentary clutch slip in	 = 4.689 1st gear ratio = 3.306 2nd gear ratio = 3.012 3rd gear ratio = 2.446 4th gear ratio = 1.923 5th gear ratio = 1.446 6th gear ratio ≤ 1.120 % of 1st gear ratio ≥ 0.880 % of 1st gear ratio ≤ 1.070 % of gear ratio ≥ 0.930 % of gear ratio ≥ 0.500 seconds ≤ 5.00 RPM ≥ 0.500 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					the C1234 clutch. After the clutch slip event, the main transmission pump and clutch will gain capacity, clutch slip will go to zero. If the vehicle is launching (moving) then a valid transmission ratio can be achieved. Or if the brake is continually applied and an autostart occurs naturally, then no ratio can be measured. In this case turbine speed will return to near zero rpm. ******************************			
					DTCs not fault active	CrankSensor_FA Transmission Output Shaft Angular Velocity Validity Transmission Turbine Angular Velocity Validity Transmission Oil Temperature Validity P171A P171B P171C U0101 P182E P1915		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Control System - Shift Limiting Active	P175E	The latent fault diagnostic monitors detects when the vehicle has been driven excessively with an emission MIL request. The DTCs requesting the emission MIL are all due to a safety critical system or component fault present in which a DTC is set fault active, test fail this key on or fault pending (fault pending is fail time ≠ 0). The safety critical systems or safety critical components include: transmission input, output and intermediate speed sensors, transmission range sensors, clutch pressure control solenoids including unintended deceleration detected due to clutch pressure control solenoids, driver accelerator pedal position, engine crankshaft position and engine torque. The DTCs for these safety critical systems or safety critical components include both electrical fault DTCs and performance fault DTCs. The latent fault diagnostic monitor	P0747 OR P0777 OR P0797 OR P2715 OR P2724 OR P2731 OR P2733 fault active due to unintended deceleration detection, increment unintended deceleration latent fault fail count		transmission default gear active (emission MIL active) calibration CeTRDR_e_DSG_DfltGrOpt5_Action any non-zero (0) option	> CeTRDR_e_DSG_DfltGrOptNone, zero (0) element in default gear array	unintended deceleration latent fault fail count ≥ 100 counts 25 millisecond update rate	Type A, 1 Trips
			P0747 OR P0777 OR P0797 OR P2715 OR P2724 OR P2731 OR P2733 clutch pressure control solenoid fault active due to clutch stuck on during shift, increment clutch pressure control solenoid latent fault fail count		transmission default gear active (emission MIL active) calibration CeTRDR_e_DSG_DfltGrOpt5_Action any non-zero (0) option	> CeTRDR_e_DSG_DfltGrOptNone, zero (0) element in default gear array	clutch pressure control solenoid latent fault fail count ≥ 100 counts 25 millisecond update rate	
			P2802 OR P2803 fault active, increment transmission range sensor latent fault fail count		transmission default gear active (emission MIL active) calibration CeTRDR_e_DSG_DfltGrOptNone any non-zero (0) option	> CeTRDR_e_DSG_DfltGrOptNone, zero (0) element in default gear array	transmission range sensor latent fault fail count ≥ 200 counts 25 millisecond update rate	
			P0721 OR P0722 OR P0723 OR P077C OR P077D or P172A fault active, increment transmission output speed sensor latent fault fail count		transmission default gear active (emission MIL active) calibration CeTRDR_e_DSG_DfltGrOpt5_Action any non-zero (0) option	> CeTRDR_e_DSG_DfltGrOptNone, zero (0) element in default gear array	transmission output speed sensor latent fault fail count ≥ 100 counts 25 millisecond update rate	
			P0716 OR P0717 OR P0721 OR P07BF OR P07C0 fault active OR		transmission default gear active (emission MIL active) calibration	>	transmission input output speed sensor latent fault fail	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		counts the run/crank ignition cycles before the latent fault DTC is set fault active.	P077D OR P077D OR P1783 OR P17CE fault active OR P0722 OR P0723 OR P172A test fail this key on OR P0716 OR P0717 OR P0721 OR P0722 OR P0723 OR P077C OR P077D OR P07BF OR P07C0 Or P172A OR P172B OR P1783 OR P17CE fault pending (fail time ≠ 0) increment transmission input output speed sensor latent fault fail count		CeTRDR_e_DSG_DfltGr Opt5_Action any non-zero (0) option	CeTRDR_e_DSG_DfltGr OptNone, zero (0) element in default gear array	count ≥ 100 counts 25 millisecond update rate	
			AcceleratorPedalFailure OR EngineTorqueEstInaccurate OR P2534 fault active OR CrankSensor_FA OR P0707 OR P0708 fault active OR test fail this key on OR P2805 fault active OR P0716 OR P0717 OR P07BF OR P07C0 fault active OR P0722 OR P0723 test fail this key on OR P077C OR P077D fault active OR P176C OR P176D OR	= TRUE = TRUE = TRUE	transmission default gear active (emission MIL active) calibration CeTRDR_e_DSG_DfltGr Opt5_Action any non-zero (0) option ignition run crank voltage for time	> CeTRDR_e_DSG_DfltGr OptNone, zero (0) element in default gear array > 5.00 volts ≥ 12.5 milliseconds	system latent fault fail count ≥ 100 counts 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			P17CC OR P17CD OR P176B OR P17D6 fault active OR test fail this key on OR P0747 OR P0777 OR P0797 OR P2715 OR P2724 OR P2733 OR P0746 OR P0776 OR P0796 OR P2714 OR P2723 OR P2732 OR P178F OR P17C4 OR P17C6 OR P172A OR P172B test fail this key on OR P0960 OR P0962 OR P0963 OR P0964 OR P0966 OR P0967 OR P0968 OR P0970 OR P0971 OR P2718 OR P2720 OR P2721 OR P2727 OR P2729 OR P2730 OR P2736 OR P2738 OR P2739 OR P17C5 OR P17D3OR P0721 fault active OR P0716 OR P0717 OR P0721 OR P0722 OR P0723 OR P077C OR P077D OR P07BF OR P07C0 fault pending (fail time ≠ 0) OR P176B OR P176C OR P176D OR P17CC OR P17CD OR P17D6 OR P1783 OR P178F OR P17C4 OR P17C5 OR P17C6 OR P17CE OR P17D3 OR P172A or P172B fault pending (fail					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			time ≠ 0) OR P1783 fault active OR P1783 fault pending (fail time ≠ 0) update system fault time when system fault time increment system latent fault fail count	≥ 10.0 seconds				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Acceleration Sensor Signal Message Counter Incorrect	P175F	The diagnostic monitor detects an alive rolling count error or checksum error in the CAN frame containing the lateral acceleration signal value and longitudinal acceleration sensor signal value.	rolling count value received from EBCM and expected TCM calculated value not equal OR checksum lateral and longitudinal acceleration CAN frame message value error 50 millisecond update rate	= TRUE = TRUE	enable alive rolling count error detection: diagnostic monitor enable lateral and longitudinal acceleration CAN frame message received battery voltage run crank voltage enable checksum error detection: diagnostic monitor enable lateral and longitudinal acceleration CAN frame message received normal CAN battery voltage run crank voltage communication enabled DTCs not fault active	 = 1 Boolean = TRUE ≥ 11.0 volts ≥ 11.0 volts = 1 Boolean = TRUE ≥ 11.0 volts ≥ 11.0 volts = TRUE U0073	alive rolling count errors ≥ 54 out of 9 sample counts 50 millisecond update rate checksum error time ≥ 54.00 seconds	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Up and Down Shift Switch Signal Circuit	P1761	The alive rolling count normally cycles 0, 1, 2, and 3 as a serial data periodic frame is processed normally. The diagnostic monitor counts the number of times an alive rolling count error occurs over a period of time. The TCM receives a serial data frame at a periodic rate, during which, the receive data is processed the comparing the current value of the alive rolling count in the frame date to the incremented value of the diagnostic alive rolling count. When the two values of the alive rolling count do not agree, an alive rolling count error has occurred. The error indicator is saved in an array buffer, and when the number of error indicators in the buffer exceed the fail threshold the fail time is allowed to time up.	alive rolling count error counter update fail time 100 millisecond update rate	≥ 3 counts	service mode $04 active diagnostic monitor enable run crank voltage up and down shift serial data frame receive occurred when up and down shift serial data frame receive occurred: increment the diagnsotic alive rolling count data value, if the diagnsotic alive rolling count data value, set alive rolling count error to TRUE, when alive rolling count error AND previous alive rolling count error in 10 element arrary buffer, increment alive rolling count error counter	= FALSE = 1 Boolean ≥ 9.00 volts = TRUE ≠ frame alive rolling count data value = TRUE = FALSE	fail time ≥ 10.00 seconds run crank voltage time ≥ 0.100 seconds	Emissions Neutral Diagnostic – Type C

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Planetary Gearset Ring Gear Speed Sensor Circuit Range/ Performance	P176B	The diagnostic monitor rationalizes the transmission intermediate shaft speed sensor by using the transmission output shaft output speed sensor and the known ratio between the transmission intermediate shaft speed and the transmission output shaft output speed based on the commanded gear and the transmission lever node design. The estimated transmission intermediate shaft speed is equal to the gear ratio times the transmission output shaft output speed. The absolute value of the delta between the measured transmission intermediate shaft speed and the estimated transmission intermediate shaft speed is used to determine if the measured transmission intermediate shaft speed is rational.	delta1 = ABS (transmission input speed - (transmission output speed * gear ratio commanded)) update faiil time 25 millisecond update rate	> 10.0 RPM	diagnostic monitor enable speed sesnor configuration calibration is single OR dual ratio calibration is function of command gear and intermediate speed sesnor when not REVERSE ratio calibration is function of command gear and intermediate speed sesnor when REVERSE ***************************** delay time updates when: estimated transmission intermediate speed (transmission input speed / ratio calibration)	= 1 Boolean = CeTNSR_e_NSPD_SinglеSpdSnsr = **P176B ratio calibration when not REVERSE** see supporting tables = **P176B ratio calibration when REVERSE** see supporting tables ***************************** ≥ **P176B minimum estimated transmission intermediate speed to enable fail evaluation** see supporting tables	fail time ≥ **P176B intermediate speed sensor fail time threshold** see supporting tables fail time threshold met increments fail count, fail count ≥ **P176B intermediate speed sensor fail count threshold** see supporting tables ****************** delay time ≥	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					with transmission input speed input speed sensor ready based on commanded gear and transmission intermediate speed sensor (state output must be FALSE to enable fail evaluation) with with attained gear ***************************** transmission input speed transmission output speed neutral idle mode range shift state P0716 fault active P0717 fault active P07BF fault active P07C0 fault active P0722 fault active P0723 fault active P077C fault active P077D fault active P176C fault active P176D fault active battery voltage	≥ **P176B minimum transmission input speed to enable fail evaluation** see supporting tables = **P176B holding clutch states** see supporting tables = REVERSE OR = 1st thru 10th ****************************** ≥ 172.0 RPM ≥ 89.0 RPM = nuetral idle mode ON = range shift complete = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE ≥ 9.00 volts = FALSE ≥ 9.00 volts	**P176B delay to allow transmission input, intermediate and output speeds to stablize for fail evaluation** see supporting tables	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					service fast learn active run crank voltage transmission hydraulic pressure available: engine speed	≥ 400.0 RPM	battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 seconds engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting tables	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Planetary Gearset Ring Gear Speed Sensor Circuit Low	P176C	Controller specific analog circuit diagnoses the transmission intermediate speed sensor and wiring for a short to ground fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission intermediate speed sesnor raw voltage, update fail time, 12.5 millisecond update rate	≤ 0.2500 volts (≤ 0.5 Ω impedance between signal and controller ground)	service mode $04 active diagnostic monitor enable P176D fault active service fast learn run crank voltage battery voltage P176C fault active P176C test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE ≥ 10.00 volts ≥ 10.00 volts = FALSE = FALSE	fail time ≥ 0.050 seconds, update fail count 12.5 millisecond update rate fail count ≥ 40 counts 12.5 millisecond update rate run crank and battery voltage time ≥ 5.000 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 Planetary Gearset Ring Gear Speed Sensor Circuit High	P176D	Controller specific analog circuit diagnoses the transmission intermediate speed sensor and wiring for a short to voltage fault by comparing a voltage measurement to controller specific voltage thresholds.	transmission intermediate speed sesnor raw voltage, update fail time, 12.5 millisecond update rate	≥ 4.7500 volts (≤ 0.5 Ω impedance between signal and controller power)	service mode $04 active diagnostic monitor enable P176C fault active service fast learn run crank voltage battery voltage P176D fault active P176D test fail this key on	= FALSE = 1 Boolean = FALSE = FALSE ≥ 10.00 volts ≥ 10.00 volts = FALSE = FALSE	fail time ≥ 0.050 seconds, update fail count 12.5 millisecond update rate fail count ≥ 40 counts 12.5 millisecond update rate run crank and battery voltage time ≥ 5.000 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Intermediate Speed Sensor 1 Direction Error	P17D3	The diagnostic monitor determines if the direction transmission intermediate speed sensor value is coherent based on the on period time of the directional sensor and raw speed sensor value. When the on period time indicates a transitional state, the direction must also be transitional as measured by very slow raw signal RPM. When the on period time indicates a non-transitional state, forward or reverse, the direction must also be transition, not forward and not reverse.	intermediate speed sesnor raw direction when transitional period = FALSE AND intermediate speed sesnor raw direction when transitional period = FALSE OR intermediate speed sesnor raw when transitional period = TRUE update fail and sample time 6.26 millisecond update rate	≠ FORWARD ≠ REVERSE ≥ **P17C5 P17D3 intermediate speed sensor RPM**	service mode $04 active diagnostic monitor enable intermediate speed sesnor count sample period P17D3 fault active OR P17D3 test fail this key on senor type cailbration (senor type is directional) transitional period detected = FALSE when: on period OR on period when direction unknown OR on period on period when direction is reverse OR on period on period when direction is forward transitional period detected = TRUE when: on period on period when direction unknown	= FALSE = 1 Boolean ≠ 0 counts = FALSE = FALSE = CeTNSR_e_NSPD_SinglеSpdSnsr ≥ 0.4434 seconds ≤ 0.2773 seconds < 0.2363 seconds > 0.1240 seconds < 0.0811 seconds > 0.0088 seconds < 0.4434 seconds > 0.2773 seconds	fail time ≥ 3.500 seconds out of sample time ≥ 5.000 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 Park Valve Position Sensor/ Switch A Circuit/Open	P17F5	The diagnostic monitor detects an illegal voltage on the park valve position sensor circuit.	raw sensor voltage raw sensor voltage	> 1.263 volts < 1.504 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch A Circuit Low	P17F6	The diagnostic monitor detects a ground short or open circuit fault in the park valve position sensor circuit.	raw sensor voltage	< 0.414 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips
			sensor voltage direct proportion raw sensor % duty cycle sensor voltage indirect proportion raw sensor % duty cycle	= CePSCD_e_VoltDirctProp ≤ 9.998 % duty cycle = CePSCD_e_VoltDirctProp ≥ 9.998 % duty cycle	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is PWM sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	1.000 seconds in 1.500 second sample 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch A Circuit High	P17F7	The diagnostic monitor detects a short to voltage circuit fault in the park valve position sensor circuit.	raw sensor voltage	> 2.538 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips
			sensor voltage direct proportion raw sensor % duty cycle sensor voltage indirect proportion raw sensor % duty cycle	= CePSCD_e_VoltDirctProp ≥ 91.998 % duty cycle = CePSCD_e_VoltDirctProp ≤ 91.998 % duty cycle	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is PWMsensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	1.000 seconds in 1.500 second sample 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch B Circuit/Open	P17FA	The diagnostic monitor detects an illegal voltage on the park valve position sensor circuit.	raw sensor voltage raw sensor voltage	> 1.263 volts < 1.504 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch B Circuit Low	P17FB	The diagnostic monitor detects a ground short or open circuit fault in the park valve position sensor circuit.	raw sensor voltage	< 0.414 volts	diagnostic monitor enable battery voltage battey voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips
			sensor voltage direct proportion raw sensor % duty cycle sensor voltage indirect proportion raw sensor % duty cycle	= CePSCD_e_VoltDirctProp ≤ 9.998 % duty cycle = CePSCD_e_VoltDirctProp ≥ 9.998 % duty cycle	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is PWM sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	1.000 seconds in 1.500 second sample 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch B Circuit High	P17FC	The diagnostic monitor detects a short to voltage circuit fault in the park valve position sensor circuit.	raw sensor voltage	> 2.538 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips
			sensor voltage direct proportion raw sensor % duty cycle sensor voltage indirect proportion raw sensor % duty cycle	= CePSCD_e_VoltDirctProp ≥ 91.998 % duty cycle = CePSCD_e_VoltDirctProp ≤ 91.998 % duty cycle	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is PWMsensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	1.000 seconds in 1.500 second sample 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Stuck On	P187D	This diagnostic monitor rationalizes the driver ETRS command direction of “out of PARK” against the actual park valve position, as the park valve position is measured by the park valve position sensor A or B.	when: (Park Valve Position Sensor A OR Park Valve Position Sensor B) AND (out of park state calculated OR out of park state calculated) update delay time when: delay time increment fail count	 = PARK = PARK = UNKNOWN = PARK ≥ **KtPSDR_t_ParkVlvStkOn_DlyLim**	park servo enable ETRS system type is internal ETRS battery voltage for battery voltage time diagnostic monitor enable park state transtion is TRUE when: (out of park state calculated OR out of park state calculated) AND P187D, P187E Test Fail This Key On AND ((ETRS command direction AND out of park state) OR (ETRS command direction AND out of park state)) otherwise park state transition is FALSE park state transition AND (P17F5, P17F6, P17F7 Fault Active OR P17FA, P17FB, P17FC Fault Active) AND P187D, P187E Fault Active park servo stuck on availabe is TRUE when: ETRS command direction ((ETRS command direction AND	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.000 seconds = 1 Boolean = PARK = OUT OF PARK = FALSE = PARK ≠ PARK ≠ PARK ≠ OUT OF PARK = TRUE = FALSE = FALSE = FALSE ≠ PARK = DRIVE	fail count ≥ 2 counts update rate 6.25 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P18AB Test Fail This Key On) OR	= FALSE		
					(ETRS command direction AND	= NEUTRAL LOW		
					P18A8 Test Fail This Key On) OR	= FALSE		
					(ETRS command direction AND	= NEUTRAL HIGH		
					P18AD Test Fail This Key On) OR	= FALSE		
					((ETRS command direction AND	= NEUTRAL SHIFT		
					(P18AB Test Fail This Key On OR	= FALSE		
					P18AD Test Fail This Key On)) OR	= FALSE		
					(ETRS command direction AND	= REVERSE		
					P18AB Test Fail This Key On))	= FALSE		
					otherwise park servo stuck on available is FALSE			
					hydraulic pressure available = TRUE when:			
					engine speed	≥ 400.0 RPM		
					for engine speed time	≥ **KtTMDC_t_EngOnHydPresThrsh**		
					otherwise hydraulic pressure available = FALSE			
					hydraulic pressure available	= TRUE		
					park servo stuck on available	= TRUE		
					(mode valve A state attained OR	= TRUE		
					P18AA Test Fail This Key On OR	= TRUE		
					P27EC Test Fail This Key	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					On OR P27EC Fault Pending) AND (mode valve B state attained OR P18AC Test Fail This Key On OR P27F0 Test Fail This Key On OR P27F0 Fault Pending)	 = TRUE = TRUE = TRUE = TRUE = TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Stuck Off	P187E	This diagnostic monitor rationalizes the driver ETRS command direction of “PARK” against the actual park valve position, as the park valve position is measured by the mode valve position sensor A and B.	when: ETRS command direction out of park state mode valve A position mode valve B position update delay time when: delay time increment fail time	 = PARK ≠ PARK = mode valve low = mode valve low ≥ **KtPSDR_t_ParkServo_EngOff_Lim**	park servo enable ETRS system type is internal ETRS battery voltage for battery voltage time engine mode run hydraulic pressure available is TRUE when: engine speed for engine speed time otherwise hydraulic pressure available is FALSE hydraulic pressure available surge accumulator on/off request engine off diagnostic enabled P187D, P187E Test Fail This Key On	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.000 seconds = FALSE ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** = FALSE = FALSE = 1 Boolean = FALSE	fail time ≥ **KtPSDR_t_ParkServo_EngOff_Lim** seconds update rate 6.25 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			when:		park servo enable	= 1 Boolean	fail count ≥ 2 counts	
			(Park Valve Position Sensor A OR	= OUT OF PARK	ETRS system type is internal ETRS	= CeTRGR_e_InternalETRS		
			Park Valve Position Sensor B) AND	= OUT OF PARK			update rate 6.25 milliseconds	
			(out of park state calculated OR	= UNKNOWN	battery voltage	≥ 9.00 volts		
					for battery voltage time	≥ 1.000 seconds		
			out of park state calculated)	= OUT OF PARK	diagnsotic monitor enable	= 1 Boolean		
			update delay time		park state transtion is TRUE when:			
			when:		(out of park state	= PARK		
			delay time	≥ **KtPSDR_t_ParkVlvStkOff_DlyLim**	calculated OR			
					out of park state calculated) AND	= OUT OF PARK		
					P187D, P187E Test Fail	= FALSE		
			increment fail count		This Key On AND			
					((ETRS command direction AND	= PARK		
					out of park state) OR	≠ PARK		
					(ETRS command direction AND	= PARK		
					out of park state))	≠ OUT OF PARK		
					otherwise park state transition is FALSE			
					park servo stuck off availabe is TRUE when: park state transtion	= TRUE		
					((P17F5, P17F6, P17F7 Fault Active OR	= FALSE		
					P17FA, P17FB, P17FC Fault Active) AND	= FALSE		
					(P187E, P187D Test Fail This Key On))	= FALSE		
					((ETRS command direction AND	= PARK		
					(P182A Fault Active OR	= FALSE		
					P182A Fault Active) AND	= TRUE		
					calculated line pressure))	≥ 1,000.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					(P18AA Test Fail This Key On	= FALSE		
					P18AC Test Fail This Key On	= FALSE		
					ETRS mode enable valve state) otherwise park servo stuck off availabe is FALSE	= ETRS zero limit (hydraulic cicruit exhausted)		
					(mode valve A state attained OR	= TRUE		
					P18AA Test Fail This Key On OR	= TRUE		
					P27EC Test Fail This Key On OR	= TRUE		
					P27EC Fault Pending) AND	= TRUE		
					(mode valve B state attained OR	= TRUE		
					P18AC Test Fail This Key On OR	= TRUE		
					P27F0 Test Fail This Key On OR	= TRUE		
					P27F0 Fault Pending OR	= TRUE		
					ETRS mode enable valve state)	= ETRS zero limit (hydraulic cicruit exhausted)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Inhibit Actuator Control Circuit Low	P18A2	Controller specific circuit diagnoses internal ETRS park solenoid for an ground short or open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground OR ≤ 0.5 Ω impedance between signal and controller ground	((battery voltage AND battery voltage AND for battery voltage time run crank voltage for run crank voltage time) OR accessory voltage active)) diagnostic monitor enable calibration	≥ 9.00 volts ≤ 32.00 volts ≥ 1.000 seconds ≥ 5.00 volts ≥ 25 milliseconds = TRUE for 12.5 milliseconds = 1 Boolean	fail time ≥ 0.100 seconds out of sample time ≥ 0.166 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 Park Inhibit Actuator Control Circuit High	P18A4	Controller specific circuit diagnoses internal ETRS park solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	((battery voltage AND battery voltage AND for battery voltage time run crank voltage for run crank voltage time) OR accessory voltage active)) diagnostic monitor enable calibration	≥ 9.00 volts ≤ 32.00 volts ≥ 1.000 seconds ≥ 5.00 volts ≥ 25 milliseconds = TRUE for 12.5 milliseconds = 1 Boolean	fail time ≥ 0.100 seconds out of sample time ≥ 0.166 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Park Inhibit Solenoid Stuck Off	P18A8	This diagnostic monitor rationalizes the park inhibit solenoid based on the driver ETRS command direction and mode valve states.	when: P18A8 Test Fail This Key On out of park state mode valve A position mode valve B position update fail time	 = FALSE ≠ OUT OF PARK = mode valve low = mode valve low	park servo enable ETRS system type is internal ETRS battery voltage for battery voltage time ignition inputs power mode hydraulic pressure available = TRUE when: engine speed for engine speed time otherwise hydraulic pressure available = FALSE engine mode run AND engine off diagnostic enable AND [auto stop active OR (auto stop active AND hydraulic pressure available)] (ETRS command direction OR ETRS command direction OR ETRS command direction OR ETRS command direction OR ETRS command direction) AND ETRS range	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.000 seconds ≠ power mode off ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** = FALSE = 1 Boolean = TRUE = FALSE = FALSE = DRIVE = REVERSE = NEUTRAL LOW = NEUTRAL HIGH = NEUTRAL SHIFT ≠ PARK	fail time ≥ **KtPSDR_t_PISA_EngOff_Lim** update rate 6.25 milliseconds	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			when: ETRS command direction P18A8 Test Fail This Key On diagnostic park state mode valve A position mode valve B position out of park state update fail time	 = NEUTRAL LOW = FALSE = OUT OF PARK = mode valve low = mode valve low ≠ OUT OF PARK	park servo enable ETRS system type is internal ETRS battery voltage for battery voltage time ignition inputs power mode hydraulic pressure available = TRUE when: engine speed for engine speed time otherwise hydraulic pressure available = FALSE hydraulic pressure available ((out of park state OR out of park state) AND P187D, P187E Test Fail This Key On) ETRS command direction	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.000 seconds ≠ power mode off ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** = TRUE = PARK = OUT OF PARK = FALSE ≠ PARK	fail time ≥ **KtPSDR_t_PISA_EngOff_Lim** update rate 6.25 milliseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control A Position Sensor/ Switch Circuit Stuck On	P18AA	This diagnostic monitor detects a Mode Valve A Position Sensor State in the "on" or "high" state, which is in error, when hydraulic pressure in the circuit used to move the mode valve is not sufficient to overcome the mode valve return spring force, leaving the mode valve mechanically in the “off” or “low” state.	Mode Valve A Position Sensor State	≠ Mode Valve Low	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time engine run mode hydraulic system pressure available surge accumulator on/off request GF9 engine off diagnsotic enable P18AA Test Fail This Key On Mode Valve A Position Sensor State Mode Valve A delay time	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds = FALSE = FALSE = FALSE = 1 Boolean = FALSE ≠ Mode Valve Low (updates Mode Valve A delay time) ≥ **KtPSDR_t_ModeVlvA_EngOff_Lim**	**KtPSDR_t_ModeVlvA_EngOff_Lim** update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control A Position Sensor/ Switch Circuit Stuck Off	P18AB	This diagnostic monitor detects a Mode Valve A Position Sensor State in the "off" or "low" state, which is in error, when hydraulic pressure in the circuit used to move the mode valve is sufficient to overcome the mode valve return spring force, leaving the mode valve mechanically in the "on" or "high" state. The diagnostic monitor also executes during transitions of the mode valve to verify Mode Valve A Position Sensor State changes correctly with mode valve state command.	during steady state control of the mode valve when mode valve A fault pending update mode valve A steady state remedial time	 = TRUE	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active position sensor diagnostic monitor enable ETRS diagnostic range P27EE fault active P27EB fault active P27ED fault active P0968 fault active P0970 fault active P0971 fault active P18AB test fail this key on P18AA test fail this key on P27EC test fail this key on mode valve A position hydraulic system pressure available when then following occur set	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean = ETRS command direction = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE ≠ **KaPSDR_e_GFX_ModeVlvA_StFnl** = TRUE	mode valve A steady state remedial time ≥ **KtPSDR_t_ModeVlvA_Rmdl_Lim** update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					initialize mode valve A steady state to TRUE otherwise set initialize mode valve A steady state to FALSE:			
					(ETRS mode enable valve state OR	= ETRS zero limit (hydraulic cicruit exhausted)		
					C3 clutch pressure) AND	< 195.0 kPa		
					drive oil latch present AND	= FALSE		
					(ETRS command direction OR	= DRIVE		
					ETRS command direction) OR	= NEUTRAL SHIFT		
					((ETRS command direction OR	= PARK		
					ETRS command direction OR	= REVERSE		
					ETRS command direction OR	= NEUTRAL LO		
					ETRS command direction) AND	= NEUTRAL HI		
					C3 clutch pressure))	> 25.0 kPa		
					when initialize mode valve A steady state	= FALSE		
					update mode valve A steady state delay time			
					when initialize mode valve A steady state AND	= FALSE		
					mode valve A steady state delay time	≥ **KtPSDR_t_ParkStatDlyLim**		
					update mode valve A steady state fail time			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					[when ETRS command direction mode valve A steady state delay time out of park state set mode valve A fault pending = TRUE OR ETRS command direction mode valve A steady state delay time mode valve A steady state fail time out of park state turbine speed set mode valve A fault pending = TRUE OR ETRS command direction mode valve A steady state delay time out of park state set mode valve A fault pending = TRUE OR ETRS command direction mode valve A steady state delay time	 = PARK ≥ **KtPSDR_t_ParkStatDlyLim** ≠ OUT OF PARK = DRIVE ≥ **KtPSDR_t_ParkStatDlyLim** ≥ **KtPSDR_t_ModeVlvA_TurbDlyLim** = OUT OF PARK ≥ 400 RPM = DRIVE ≥ **KtPSDR_t_ParkStatDlyLim** ≠ OUT OF PARK = REVERSE ≥		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					out of park state mode valve A steady state fail time turbine speed mode valve A fault pending = TRUE OR ((ETRS command direction OR ETRS command direction OR ETRS command direction) AND mode valve A steady state delay time) mode valve A fault pending = TRUE]	**KtPSDR_t_ParkStatDlyLim** = OUT OF PARK ≥ **KtPSDR_t_ModeVlvA_TurbDlyLim** ≥ 400 RPM = NEUTRAL HI = NEUTRAL LO = NEUTRAL SHIFT ≥ **KtPSDR_t_ParkStatDlyLim**		
			during steady state control of the mode valve when: mode valve A garage shift delay time increment mode valve A fail count set mode valve A fault pending set mode valve A garage shift delay time = 0.0 AND ETRS command direction OR (ETRS command direction OR	≥ KaPSDR_t_GFX_ModeVlvA_FnlDly[ETRS attained range, ETRS command range] see supporting tables = PARK = DRIVE	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active position sensor diagnostic monitor enable	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean	mode valve A fail count PARK ≥ 2 counts mode valve A fail count OUT OF PARK ≥ 2 counts update rate 6.25 milleseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			ETRS command direction OR ETRS command direction OR ETRS command direction OR ETRS command direction)	= NEUTRAL HI = NEUTRAL LO = NEUTRAL SHIFT = REVERSE	ETRS diagnostic range AND ((range commamnd actuator AND park not available) OR ((range commamnd actuator OR range commamnd actuator OR range commamnd actuator OR range commamnd actuator) AND out of park not available)) mode valve stuck on test P18AF test fail this key on P27EE fault active P27EB fault active P27ED fault active P0968 fault active P0970 fault active P0971 fault active P18AB test fail this key on P18AA test fail this key on P27EC test fail this key on mode valve A transition AND (mode valve B transition OR mode valve B state attained OR P27F0 fault active OR P18AD fault pending) mode valve A position	≠ ETRS command direction = PARK = FALSE = DRIVE = NEUTRAL = MANUAL = REVERSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = TRUE = TRUE = TRUE = TRUE = TRUE ≠ **KaPSDR_e_GFX_ModeVlvA_StFnl**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					C3 clutch pressure when all of the above condtions are met: update mode valve A garage shift delay time AND update mode valve A fail count	< 195.0 kPa		
			during the actuation of the mode valve the transitional fail counter will increment when any one the following transitions occur but the sensor does not change state mode valve A transition fault pending set = TRUE when: ETRS diagnostic command direction (out of park state OR ETRS mode enable valve state) mode valve A garage shift fail time mode valve A transition fail count (mode valve A fault pending = TRUE) OR	= PARK ≠ OUT OF PARK = ETRS zero limit (hydraulic cicruit exhausted) ≥ **KtPSDR_t_ModeVlvA_GS_TurbDlyLim** > 0 counts	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active position sensor diagnostic monitor enable ETRS diagnostic range AND ((range commamnd actuator AND park not available) OR ((range commamnd actuator OR range commamnd actuator OR range commamnd actuator OR	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean ≠ ETRS command direction = PARK = FALSE = DRIVE = NEUTRAL SHIFT = MANUAL	mode valve A transition fail count PARK ≥ 2 counts mode valve A transition fail count OUT OF PARK ≥ 2 counts update rate 6.25 milleseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			ETRS diagnostic	= DRIVE	range commamnd	= REVERSE		
			command direction		actuator) AND			
			ETRS diagnostic range	= PARK	out of park not available))	= FALSE		
			out of park state	≠ OUT OF PARK				
			mode valve A garage shift	≥	mode valve stuck on test	= FALSE		
			fail time	**KtPSDR_t_ModeVlvA**	P18AF test fail this key on	= FALSE		
				_GS_TurbDlyLim				
					P27EE fault active	= FALSE		
			mode valve A transition	> 0 counts	P27EB fault active	= FALSE		
			fail count (mode valve A		P27ED fault active	= FALSE		
			fault pending = TRUE)		P0968 fault active	= FALSE		
					P0970 fault active	= FALSE		
					P0971 fault active	= FALSE		
			OR		P18AB test fail this key on	= FALSE		
					P18AA test fail this key on	= FALSE		
					P27EC test fail this key on	= FALSE		
			ETRS diagnostic	= DRIVE				
			command direction		hydraulic system pressure	= TRUE		
			ETRS diagnostic range	≠ PARK	available AND			
			mode valve A garage shift	≥	ETRS command direction	≠ ETRS command		
			fail time	**KtPSDR_t_ModeVlvA**	AND	direction previous		
				_GS_TurbDlyLim	mode valve A state	= FALSE		
					attained AND			
			mode valve A transition	> 0 counts	mode valve A transition	= FALSE		
			fail count (mode valve A		AND			
			fault pending = TRUE)		((ETRS diagnostic range	= NEUTRAL SHIFT		
					OR			
					mode valve B transition	= TRUE		
			OR		OR			
					mode valve B attained OR	= TRUE		
					ETRS mode enable valve	= ETRS zero limit		
			(ETRS diagnostic	= REVERSE	state) AND	(hydraulic cicruit		
			command direction OR			exhausted)		
			ETRS diagnostic	= NEUTRAL LO	ETRS diagnostic range)	= DRIVE		
			command direction OR					
			ETRS diagnostic	= NEUTRAL HI	((mode valve A transition	= FALSE		
			command direction OR		AND			
			ETRS diagnostic)	= NEUTRAL SHIFT	mode valve A transition	≥		
			mode valve A garage shift	≥	delay time)	KaPSDR_t_GFX_ModeVl		
			fail time	**KtPSDR_t_ModeVlvA**	OR	vA_TrnstnDly[ETRS		
				_GS_TurbDlyLim		diagnostic range, ETRS		
			mode valve A transition			command direction]		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			fail count (mode valve A fault pending = TRUE) when: mode valve A transition fault pending increment: mode valve A transition fail count AND set mode valve A transition fault pending = FALSE set mode valve A garage shift fail time = 0.0	> 0 counts = TRUE	mode valve A garage shift fail time) {}{}{mode valve A garage shift fail time increments when P18AB fault pending AND mode valve A transitional fail count AND intialize mode valve A transition}	see supporting tables > 0 seconds = TRUE = 0 counts = FALSE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control B Position Sensor/ Switch Circuit Stuck On	P18AC	This diagnostic monitor detects a Mode Valve B Position Sensor State in the "on" or "high" state, which is in error, when hydraulic pressure in the circuit used to move the mode valve is not sufficient to overcome the mode valve return spring force, leaving the mode valve mechanically in the “off” or “low” state.	Mode Valve B Position Sensor State	≠ Mode Valve Low	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time engine run mode hydraulic system pressure available surge accumulator on/off request GF9 engine off diagnsotic enable P18A Test Fail This Key On Mode Valve A Position Sensor State Mode Valve A delay time	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds = FALSE = FALSE = FALSE = 1 Boolean = FALSE ≠ Mode Valve Low (updates Mode Valve B delay time) ≥ **KtPSDR_t_ModeVlvB_EngOff_Lim**	**KtPSDR_t_ModeVlvB_EngOff_Lim** update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control B Position Sensor/ Switch Circuit Stuck Off	P18AD	This diagnostic monitor detects a Mode Valve B Position Sensor State in the "off" or "low" state, which is in error, when hydraulic pressure in the circuit used to move the mode valve is sufficient to overcome the mode valve return spring force, leaving the mode valve mechanically in the “on” or “high” state. The diagnostic monitor also executes during transitions of the mode valve to verify Mode Valve B Position Sensor State changes correctly with mode valve state command.	during steady state control of the mode valve when mode valve B fault pending update mode valve B steady state remedial time	 = TRUE	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active position sensor diagnostic monitor enable ETRS diagnostic range P27F2 fault active P27EF fault active P27F1 fault active P2718 fault active P2720 fault active P2721 fault active P18AD test fail this key on P18AC test fail this key on P27F0 test fail this key on mode valve B position hydraulic system pressure available when then following occur set	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean = ETRS command direction = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE ≠ **KaPSDR_e_GFX_ModeVlvB_StFnl** = TRUE	mode valve B steady state remedial time ≥ **KtPSDR_t_ModeVlvA_Rmdl_Lim** update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					initialize mode valve B steady state to TRUE otherwise set initialize mode valve B steady state to FALSE:			
					((ETRS mode enable valve state OR	= ETRS zero limit (hydraulic cicruit exhausted)		
					C4 clutch pressure) AND	< 295.0 kPa		
					(ETRS command direction OR	= REVERSE		
					ETRS command direction OR	= NEUTRAL HI		
					ETRS command direction))	= NEUTRAL SHIFT		
					OR			
					((ETRS command direction OR	= DRIVE		
					ETRS command direction OR	= PARK		
					ETRS command direction)	= NEUTRAL LO		
					AND			
					C4 clutch pressure)	> 25.0 kPa		
					when			
					initialize mode valve B steady state	= FALSE		
					update mode valve B steady state delay time			
					when			
					initialize mode valve B steady state AND	= FALSE		
					mode valve B steady state delay time	≥ **KtPSDR_t_ParkStatDlyLim**		
					update mode valve B steady state fail time			
					[			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					when ETRS command direction mode valve B steady state delay time out of park state set mode valve B fault pending = TRUE OR ETRS command direction mode valve B steady state delay time mode valve B steady state fail time ((out of park state AND turbine speed) OR out of park state)) set mode valve B fault pending = TRUE OR ETRS command direction mode valve B steady state delay time mode valve B steady state fail time ((out of park state AND turbine speed) OR out of park state) set mode valve B fault pending = TRUE	 = PARK ≥ **KtPSDR_t_ParkStatDlyLim** ≠ PARK = REVERSE ≥ **KtPSDR_t_ParkStatDlyLim** ≥ **KtPSDR_t_ModeVlvB_TurbDlyLim** = OUT OF PARK > 400 RPM ≠ OUT OF PARK = DRIVE ≥ **KtPSDR_t_ParkStatDlyLim** ≥ **KtPSDR_t_ModeVlvB_TurbDlyLim** = OUT OF PARK > 400 RPM ≠ OUT OF PARK		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					OR ETRS command direction mode valve B steady state delay time out of park state set mode valve B fault pending = TRUE OR ((ETRS command direction OR ETRS command direction) AND mode valve A steady state delay time) mode valve B fault pending = TRUE]	 = NEUTRAL LO ≥ **KtPSDR_t_ParkStatDlyLim** = OUT OF PARK = NEUTRAL HI = NEUTRAL SHIFT ≥ **KtPSDR_t_ParkStatDlyLim**		
			during steady state control of the mode valve when: mode valve B garage shift delay time increment mode valve B fail count set mode valve B fault pending set mode valve B garage shift delay time = 0.0 AND ETRS command direction OR (ETRS command	 ≥ KaPSDR_t_GFX_ModeVlvB_FnlDly[ETRS attained range, ETRS command range] see supporting tables = PARK = DRIVE	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active position sensor diagnostic	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean	mode valve B fail count PARK ≥ 2 counts mode valve B fail count OUT OF PARK ≥ 2 counts update rate 6.25 milleseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			direction OR ETRS command direction OR ETRS command direction OR ETRS command direction OR ETRS command direction)	 = NEUTRAL HI = NEUTRAL LO = NEUTRAL SHIFT = REVERSE	monitor enable ETRS diagnostic range AND ((range commamnd actuator AND park not available) OR ((range commamnd actuator OR range commamnd actuator OR range commamnd actuator OR range commamnd actuator) AND out of park not available)) mode valve stuck on test P18AF test fail this key on P27F2 fault active P27EF fault active P27F1 fault active P2718 fault active P2720 fault active P2721 fault active P18AD test fail this key on P18AC test fail this key on P27F0 test fail this key on mode valve B transition AND (mode valve B transition OR mode valve B state attained OR P27EC fault active OR P18AB fault pending) mode valve B position	 ≠ ETRS command direction = PARK = FALSE = DRIVE = NEUTRAL = MANUAL = REVERSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = TRUE = TRUE = TRUE = TRUE = TRUE ≠ **KaPSDR_e_GFX_ModeVlvB_StFnl**		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					C4 clutch pressure when all of the above condtions are met: update mode valve B garage shift delay time AND update mode valve A fail count	< 295.0 kPa		
			during the actuation of the mode valve the transitional fail counter will increment when any one the following transitions occur but the sensor does not change state mode valve B transition fault pending set = TRUE when: ETRS diagnostic command direction (out of park state OR ETRS mode enable valve state) mode valve B garage shift fail time OR mode valve B transition fail count (mode valve B fault pending = TRUE) OR	= PARK ≠ OUT OF PARK = ETRS zero limit (hydraulic cicruit exhausted) ≥ **KtPSDR_t_ModeVlvB_TurbDlyLim** > 0 counts	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active position sensor diagnostic monitor enable ETRS diagnostic range AND ((range commamnd actuator AND park not available) OR ((range commamnd actuator OR range commamnd actuator OR range commamnd	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean ≠ ETRS command direction = PARK = FALSE = DRIVE = NEUTRAL = MANUAL	mode valve A transition fail count PARK ≥ 2 counts mode valve A transition fail count OUT OF PARK ≥ 2 counts update rate 6.25 milleseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			ETRS diagnostic command direction mode valve B garage shift fail time OR mode valve B transition fail count (mode valve B fault pending = TRUE) OR (ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction) ETRS diagnostic range out of park status (mode valve B garage shift fail time OR mode valve B transition fail count) (mode valve B fault pending = TRUE) OR (ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction) ETRS diagnostic range	= DRIVE ≥ **KtPSDR_t_ModeVlvB _TurbDlyLim** > 0 counts = REVERSE = NUETRAL LO = NEUTRAL HI = PARK ≠ OUT OF PARK ≥ **KtPSDR_t_ModeVlvB _TurbDlyLim** > 0 counts = REVERSE = NEUTRAL LO = NEUTRAL HI = NEUTRAL SHIFT ≠ PARK	actuator OR range commamnd actuator) AND out of park not available)) ETRS command direction prevoius mode valve stuck on test P18AF test fail this key on P27F2 fault active P27EF fault active P27F1 fault active P2718 fault active P2720 fault active P2721 fault active P18AD test fail this key on P18AC test fail this key on P27F0 test fail this key on hydraulic system pressure available AND ETRS command direction AND mode valve B state attained AND mode valve B transition AND (ETRS diagnostic range OR mode valve A transition OR mode valve A attained) ((mode valve B transition AND mode valve B transition delay time) OR	= REVERSE = FALSE ≠ ETRS command direction = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = TRUE ≠ ETRS command direction previous = FALSE = FALSE = NEUTRAL SHIFT = TRUE = TRUE = FALSE ≥ KaPSDR_t_GFX_ModeVlvB_TrnstnDly[ETRS diagnostic range, ETRS command direction]		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			(mode valve B garage shift fail time OR mode valve B transition fail count) (mode valve B fault pending = TRUE) when: mode valve B transition fault pending increment: mode valve B transition fail count AND set mode valve B transition fault pending = FALSE set mode valve B garage shift fail time = 0.0	≥ **KtPSDR_t_ModeVlvB_TurbDlyLim** > 0 counts = TRUE	mode valve B garage shift fail time) {}{}{mode valve B garage shift fail time increments when P18AD fault pending AND mode valve B transitional fail count AND intialize mode valve B transition}	see supporting tables > 0 seconds = TRUE = 0 counts = FALSE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control Enable Valve Stuck On	P18AE	This diagnostic monitor detects the Mode Valve A Solenoid stuck in the hydraulic on state.	when mode valve A delay time increment mode valve A fail count	≥ **KtPSDR_t_ModeEnblTestLim**	park diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active mode valve performance diagnostic monitor enable ETRS diagnostic command direction ETRS diagnostic range mode valve diagnostic enable transmssion fluid tempertaure transmssion fluid tempertaure mode valve A position when all the above criteria are met: increment mode valve A delay time	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean = PARK = DRIVE = 1 Boolean ≥ 0.00 °C ≤ 256.0 °C ≠ mode valve low	mode valve A fail count ≥ 2 counts update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch "A" Performance	P18E7	This diagnostic monitor detects park valve position sensor A performance faults, the sensor is indicating not park when command is park, or sensor does not transition when park is not commanded.	when: park valve position sensor A delay time increment park valve position sensor A fail count	≥ 0.2500 seconds	PARK diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active park valve position sensor performance diagnostic monitor enable park state transtion P17E7 fault active P17F5 fault active P17F6 fault active P17FC fault active P17FA fault active P17FB fault active (ETRS diagnostic command direction diagnostic park state) OR ((ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction OR	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = PARK = PARK = DRIVE = REVERSE = NEUTRAL LO = NEUTRAL HI	park valve position sensor A fail count ≥ 2 counts update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					ETRS diagnostic command direction) AND diagnostic park state)) P18E7 test fail this key on P18E7 fault pending park state sensor A when the above condtions are met: park valve position sensor A delay time	= NEUTRAL SHIFT = OUT OF PARK = FALSE = FALSE ≠ PARK		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Park Valve Position Sensor/ Switch "B" Performance	P18E8	This diagnostic monitor detects park valve position sensor B performance faults, the sensor is indicating not park when command is park, or sensor does not transition when park is not commanded.	when: park valve position sensor B delay time increment park valve position sensor B fail count	≥ 0.2500 seconds	PARK diagnostic monitor enable ETRS system configuration is internal ERTS battery voltage batyer voltage time ignition inputs power mode (engine run mode OR hydraulic system pressure available) engine auto stop active park valve position sensor performance diagnostic monitor enable park state transtion P17E7 fault active P17F5 fault active P17F6 fault active P17FC fault active P17FA fault active P17FB fault active (ETRS diagnostic command direction diagnostic park state) OR ((ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction OR ETRS diagnostic command direction OR	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.00 seconds ≠ power mode off = TRUE = TRUE = FALSE = 1 Boolean = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = PARK = PARK = DRIVE = REVERSE = NEUTRAL LO = NEUTRAL HI	park valve position sensor B fail count ≥ 2 counts update rate 6.25 milleseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					ETRS diagnostic command direction) AND diagnostic park state)) P18E7 test fail this key on P18E7 fault pending park state sensor B when the above condtions are met: park valve position sensor B delay time	= NEUTRAL SHIFT = OUT OF PARK = FALSE = FALSE ≠ PARK		

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 low ignition switch run/start position curcuit. This diagnostic reports the DTC when this circut is low. Monitoring occurs when the ECM run/ crank is active.	Ignition switch Run/Start position circuit low	Run / Crank = FALSE	Ignition switch Run/Start position circuit low diag enable and Run / Crank active ECM	= 1.00 = TRUE	280 failures out of 280 samples 25 ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Switch Run/ Start Position Circuit High	P2535	Detects a high ignition switch run/start position curcuit. This diagnostic reports the DTC when this circut is high. Monitoring occurs when the ECM run/ crank is NOT active.	Ignition switch Run/Start position circuit high	Run / Crank = TRUE	Ignition switch Run/Start position circuit low diag enable and Run / Crank active ECM	= 1.00 = FALSE	280 failures out of 280 samples 25 ms / sample	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Ignition Switch Accessory Position Circuit Low	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 > 32.0 seconds. Diagnostic fails when pass counts are	< 1 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.
Actuator Supply Voltage B Circuit Low	P2670	Controller specific output driver circuit diagnoses the high sided driver circuit 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	diagnostic monitor enable high side drive 2 ON P2670 fault active P2670 test fail this key on	= 1 Boolean = TRUE = FALSE = FALSE	fail count ≥ 6 counts out of sample count ≥ 2,400 counts 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid D Stuck Off	P2714	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. In the failure mode the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line	C1 clutch slip speed, update fail time 6.25 milliscond update	≥ 200.0 RPM			fail time ≥ 3.00 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update	Type A, 1 Trips
					use battery voltage calibration is FALSE OR	= 1 Boolean		
					(use battery voltage calibration is TRUE AND	= 1 Boolean		
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					use run crank voltage calibration is FALSE OR	= 0 Boolean		
					(use run crank voltage calibration is TRUE AND	= 0 Boolean		
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure control, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch pressure control solenoid is failed hydraulically off, the clutch does not maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed in the opposite sense, clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional, which must take priority over any clutch pressure control solenoid stuck off diagnostic monitor. All clutch pressure control			available: engine speed enable C4 clutch slip speed fail compare when: diagnostic clutch test C4 ((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) unintended deceleration fault pending OR unintended deceleration fault pending enable FASLE (startle mitigation) clutch steady state adaptive active transmission output shaft speed C4 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation accelerator pedal position engine speed diagnostic clutch test C4 set to HOLDING CLUTCH when: clutch solenoid test state	≥ 400.0 RPM = HOLDING CLUTCH = FALSE = TRUE ≠ initial startle mitigation gear = FALSE = 0 Boolean = FALSE ≥ 89.0 RPM = TRUE ≥ 2.00 % ≥ 1,500.0 RPM = NEUTRAL TEST	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 C4 C4, or, GR10 C4 C123467810R, clutch pressure control solenoid.			((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) C4 clutch pressured map clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on	= FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, C4 clutch pressure has transtioned from off-applying-applied = TRUE ≠ range shift completed = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed	initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					failure modes, the clutch pressure control solenoid stuck on DTCs being P0747 P0777 P0797 P2715 P2724 P2733 P2821			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid D Stuck On	P2715	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C4 clutch slip speed OR shift type is not power down shift, C4 clutch slip speed update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean	shift type is power down shift, fail time ≥ 0.800 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the pressure control solenoid stuck on diagnostic monitor, the safety startle mitigation function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional. All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled service fast learn active service solenoid cleaning procedure active hydraulic pressure available: engine speed transmission output shaft speed set solenoid stuck on test trigger to TRUE when: clutch pressure control solenoid stuck off stuck intrusive shift request startle mitigation active (see startle mitigation active NOTE below) clutch control solenoid test state clutch control solenoid test state (see clutch control solenoid test state NOTE below) initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE Boolean = FALSE Boolean = FALSE Boolean ≥ 400.0 RPM ≥ 89.0 RPM = FALSE = FALSE ≠ TIE UP TEST TEST STATE ≠ TIE UP TEST HOLD = TRUE	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C4 C4, or, GR10 C4 C123467810R, clutch pressure control solenoid.			and off for auto trans shift)			
					(shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift	= 0 Boolean		
					OR			
					shift type enable for garage shift	= 0 Boolean		
					OR			
					shift type enable for negative torque up shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power on up shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle down shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power down shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle lift foot up shift)	= 0 Boolean		
					OR			
					clutch control solenoid test state	= TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					transition clutch controller	= TRUE		
					active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift)	≠ staged steady state		
					set clutch control solenoid test state to TIE UP TEST			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when: solenoid stuck on test trigger current loop clutch control solenoid test state OR current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below) range shift state solenoid stuck on test trigger additional off going clutch occured (clutch control solenoid test state OR clutch control solenoid test state) (see clutch control solenoid test state NOTE below) diagnostic clutch test (C4 off going clutch pressure control ramp time out complete AND off going clutch pressure ramp control ramp time out enable) OR C4 off going clutch pressure	= TRUE = TEST WAITING = TIE UP TEST HOLD ≠ range shift complete = TRUE = TRUE = TIE UP TEST TEST STATE = TIE UP TEST HOLD = OFF GOING CLUTCH TEST = TRUE = 1 Boolean ≤ 350.0 kPa	for C4 off going clutch pressure time ≥ **P2715 C4 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							P2715 C4 clutch exhaust delay time open throttle power on up shift OR **P2715 C4 clutch exhaust delay time garage shift** OR **P2715 C4 clutch exhaust delay time closed throttle down shift** OR **P2715 C4 clutch exhaust delay time negative torque up shift** OR **P2715 C4 clutch exhaust delay time open throttle power down shift** see supporting tables	
					engine torque	≥ 8,191.8 Nm		
					primary on coming clutch active	= TRUE		
					primary on coming control state	≠ clutch fill phase		
					closed throttle lift foot up shift primary on coming clutch pressure OR	≥ 850.0 kPa		
					open throttle power on up shift primary on coming clutch pressure OR	≥ 850.0 kPA		
					garage shift primary on	≥ 750.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 850.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 850.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 850.0 kPa		
					C4 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

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	Controller specific circuit diagnoses 9 speed C4 or 10 speed C123467810R clutch solenoid for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	P2720	Controller specific circuit diagnoses 9 speed C4 or 10 speed C123467810R clutch solenoid for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ s 0.500 econds	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	P2721	Controller specific circuit diagnoses 9 speed C4 or 10 speed C123467810R clutch solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Stuck Off	P2723	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. In the failure mode the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line	C1 clutch slip speed, update fail time 6.25 milliscond update	≥ 200.0 RPM			fail time ≥ 3.00 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update	Type A, 1 Trips
					use battery voltage calibration is FALSE OR	= 1 Boolean		
					(use battery voltage calibration is TRUE AND	= 1 Boolean		
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					use run crank voltage calibration is FALSE OR	= 0 Boolean		
					(use run crank voltage calibration is TRUE AND	= 0 Boolean		
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure control, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch pressure control solenoid is failed hydraulically off, the clutch does not maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed in the opposite sense, clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional, which must take priority over any clutch pressure control solenoid stuck off diagnostic monitor. All clutch pressure control			available: engine speed enable C5 clutch slip speed fail compare when: diagnostic clutch test C5 ((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) unintended deceleration fault pending OR unintended deceleration fault pending enable FASLE (startle mitigation) clutch steady state adaptive active transmission output shaft speed C5 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation accelerator pedal position engine speed diagnostic clutch test C5 set to HOLDING CLUTCH when: clutch solenoid test state	≥ 400.0 RPM = HOLDING CLUTCH = FALSE = TRUE ≠ initial startle mitigation gear = FALSE = 0 Boolean = FALSE ≥ 89.0 RPM = TRUE ≥ 2.00 % ≥ 1,500.0 RPM = NEUTRAL TEST	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 C5 C57R, or, GR10 C5 C1356789, clutch pressure control solenoid.			((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) C5 clutch pressured map clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on	= FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, C5 clutch pressure has transtioned from off-applying-applied = TRUE ≠ range shift completed = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed	initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					failure modes, the clutch pressure control solenoid stuck on DTCs being P0747 P0777 P0797 P2715 P2724 P2733 P2821			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid E Stuck On	P2724	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C5 clutch slip speed OR shift type is not power down shift, C5 clutch slip speed update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean	shift type is power down shift, fail time ≥ 0.400 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
		pressure control solenoid stuck on			service fast learn active	= FALSE Boolean		
		diagnostic monitor, the safety startle mitigation			service solenoid cleaning procedure active	= FALSE Boolean		
		function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control			hydraulic pressure available: engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
		solenoid that has failed hydraulically on, while the solenoid is electrically functional.			transmission output shaft speed	≥ 89.0 RPM		
		All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL			set solenoid stuck on test trigger to TRUE when: clutch pressure control solenoid stuck off stuck intrusive shift request	= FALSE		
		DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits			startle mitigation active (see startle mitigation active NOTE below)	= FALSE		
		must be functional, no clutch pressure control			clutch control solenoid test state	≠ TIE UP TEST TEST STATE		
		solenoid electrical or performance faults can be present, and no speed sensor electrical			clutch control solenoid test state (see clutch control solenoid test state NOTE below)	≠ TIE UP TEST HOLD		
		or performance faults can be present, or the a clutch pressure control solenoid stuck			initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C5 C57R, or, GR10 C5 C1356789, clutch pressure control solenoid.			and off for auto trans shift) (shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift OR shift type enable for garage shift OR shift type enable for negative torque up shift OR shift type enable for open throttle power on up shift OR shift type enable for closed throttle down shift OR shift type enable for open throttle power down shift OR shift type enable for closed throttle lift foot up shift) OR clutch control solenoid test state clutch control solenoid test state (see clutch control solenoid test state NOTE below) transition clutch controller active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift) set clutch control solenoid test state to TIE UP TEST	= 0 Boolean = 0 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 1 Boolean = 0 Boolean = TIE UP TEST TEST STATE = TIE UP TEST HOLD = TRUE ≠ staged steady state		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when: solenoid stuck on test trigger current loop clutch control solenoid test state OR current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below) range shift state solenoid stuck on test trigger additional off going clutch occured (clutch control solenoid test state OR clutch control solenoid test state) (see clutch control solenoid test state NOTE below) diagnostic clutch test (C5 off going clutch pressure control ramp time out complete AND off going clutch pressure ramp control ramp time out enable) OR C5 off going clutch pressure	 = TRUE = TEST WAITING = TIE UP TEST HOLD ≠ range shift complete = TRUE = TRUE = TIE UP TEST TEST STATE = TIE UP TEST HOLD = OFF GOING CLUTCH TEST = TRUE = 1 Boolean ≤ 350.0 kPa	for C5 off going clutch pressure time ≥ **P2724 C5 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							P2724 C5 clutch exhaust delay time open throttle power on up shift OR **P2724 C5 clutch exhaust delay time garage shift** OR **P2724 C5 clutch exhaust delay time closed throttle down shift** OR **P2724 C5 clutch exhaust delay time negative torque up shift** OR **P2724 C5 clutch exhaust delay time open throttle power down shift** see supporting tables	
					engine torque	≥ 8,191.8 Nm		
					primary on coming clutch active	= TRUE		
					primary on coming control state	≠ clutch fill phase		
					closed throttle lift foot up shift primary on coming clutch pressure OR	≥ 703.0 kPa		
					open throttle power on up shift primary on coming clutch pressure OR	≥ 703.0 kPA		
					garage shift primary on	≥ 750.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 703.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 703.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 703.0 kPa		
					C5 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

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	Controller specific circuit diagnoses 9 speed C57R or 10 speed C1356789 clutch solenoid for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	P2729	Controller specific circuit diagnoses 9 speed C57R or 10 speed C1356789 clutch solenoid for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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	P2730	Controller specific circuit diagnoses 9 speed C57R or 10 speed C1356789 clutch solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 F Stuck On	P2731	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C6 clutch slip speed OR shift type is not power down shift, C6 clutch slip speed GF9 specific: Selectable One Way Clutch (SOWC) CBR1 is multiplexed to C6 clutch pressure AND (attained gear OR attained gear) update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM = 1st lock = first free wheel	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean	shift type is power down shift, fail time ≥ 0.800 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the pressure control solenoid stuck on diagnostic monitor, the safety startle mitigation function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional. All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure available: engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
					transmission output shaft speed	≥ 89.0 RPM		
					set solenoid stuck on test trigger to TRUE when: clutch pressure control solenoid stuck off stuck intrusive shift request	= FALSE		
					startle mitigation active (see startle mitigation active NOTE below)	= FALSE		
					clutch control solenoid test state	≠ TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	≠ TIE UP TEST HOLD		
					initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C6 C6789/Selectable One Way Clutch (SOWC) CBR1, or, GR10 C6 C45678910R, clutch pressure control solenoid.			and off for auto trans shift)			
					(shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift	= 0 Boolean		
					OR			
					shift type enable for garage shift	= 0 Boolean		
					OR			
					shift type enable for negative torque up shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power on up shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle down shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power down shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle lift foot up shift)	= 0 Boolean		
					OR			
					clutch control solenoid test state	= TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					transition clutch controller	= TRUE		
					active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift)	≠ staged steady state		
					set clutch control solenoid test state to TIE UP TEST			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when:			
					solenoid stuck on test trigger	= TRUE		
					current loop clutch control solenoid test state	= TEST WAITING		
					OR			
					current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					range shift state	≠ range shift complete		
					solenoid stuck on test trigger	= TRUE		
					additional off going clutch occured	= TRUE		
					(clutch control solenoid test state OR	= TIE UP TEST TEST STATE		
					clutch control solenoid test state) (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					diagnostic clutch test	= OFF GOING CLUTCH TEST		
					(C6 off going clutch pressure control ramp time out complete AND	= TRUE		
					off going clutch pressure ramp control ramp time out enable)	= 1 Boolean		
					OR			
					C6 off going clutch pressure	≤ 350.0 kPa	for C6 off going clutch pressure time ≥ **P2733 C6 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					engine torque primary on coming clutch active primary on coming control state closed throttle lift foot up shift primary on coming clutch pressure OR open throttle power on up shift primary on coming clutch pressure OR garage shift primary on	≥ 8,191.8 Nm = TRUE ≠ clutch fill phase ≥ 655.0 kPa ≥ 655.0 kPA ≥ 750.0 kPa	**P2733 C6 clutch exhaust delay time open throttle power on up shift** OR **P2733 C6 clutch exhaust delay time garage shift** OR **P2733 C6 clutch exhaust delay time closed throttle down shift** OR **P2733 C6 clutch exhaust delay time negative torque up shift** OR **P2733 C6 clutch exhaust delay time open throttle power down shift** see supporting tables	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 655.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 655.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 655.0 kPa		
					C6 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid F Stuck Off	P2732	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. In the failure mode the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line	C1 clutch slip speed, update fail time 6.25 milliscond update	≥ 200.0 RPM			fail time ≥ 3.00 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update	Type A, 1 Trips
					use battery voltage calibration is FALSE OR	= 1 Boolean		
					(use battery voltage calibration is TRUE AND	= 1 Boolean		
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					use run crank voltage calibration is FALSE OR	= 0 Boolean		
					(use run crank voltage calibration is TRUE AND	= 0 Boolean		
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure control, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch pressure control solenoid is failed hydraulically off, the clutch does not maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed in the opposite sense, clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional, which must take priority over any clutch pressure control solenoid stuck off diagnostic monitor. All clutch pressure control			available: engine speed enable C6 clutch slip speed fail compare when: diagnostic clutch test C6 ((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) unintended deceleration fault pending OR unintended deceleration fault pending enable FASLE (startle mitigation) clutch steady state adaptive active transmission output shaft speed C6 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation accelerator pedal position engine speed diagnostic clutch test C6 set to HOLDING CLUTCH when: clutch solenoid test state	≥ 400.0 RPM = HOLDING CLUTCH = FALSE = TRUE ≠ initial startle mitigation gear = FALSE = 0 Boolean = FALSE ≥ 89.0 RPM = TRUE ≥ 2.00 % ≥ 1,500.0 RPM = NEUTRAL TEST	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 C6 C6789/Selectable One Way Clutch (SOWC) CBR1, or, GR10 C6 C45678910R, clutch pressure control solenoid.			((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) C6 clutch pressured map clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on	= FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, C6 clutch pressure has transtioned from off-applying-applied = TRUE ≠ range shift completed = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed	initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					failure modes, the clutch pressure control solenoid stuck on DTCs being P0747 P0777 P0797 P2715 P2724 P2733 P2821			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid F Stuck On	P2733	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch pressure control solenoid is tested during an automatic transmission shift by monitoring the off going clutch slip speed. With the clutch pressure control solenoid failed on, still allowing hydraulic pressure to the clutch being commanded off, the intended off going clutch continues to maintain torque capacity during the transmission automatic shift. In the failure mode, the off going clutch slip speed will remain near zero RPM when the clutch pressure control solenoid is commanded to an off pressure in the normal operation to release the holding clutch. The clutch slip speed is calculated based on the transmission lever node design, requiring	shift type is power down shift, C6 clutch slip speed OR shift type is not power down shift, C6 clutch slip speed update fail time 6.25 milliscond update	 < 50.0 RPM < 50.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean	shift type is power down shift, fail time ≥ 0.800 seconds, OR shift type is not power down shift, fail time ≥ 0.150 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. As part of the pressure control solenoid stuck on diagnostic monitor, the safety startle mitigation function executes when in steady state gear, no automatic transmission shift in progress. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional. All clutch pressure control solenoid stuck on diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck			TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled	= TRUE Boolean		
					service fast learn active	= FALSE Boolean		
					service solenoid cleaning procedure active	= FALSE Boolean		
					hydraulic pressure available: engine speed	≥ 400.0 RPM	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	
					transmission output shaft speed	≥ 89.0 RPM		
					set solenoid stuck on test trigger to TRUE when: clutch pressure control solenoid stuck off stuck intrusive shift request	= FALSE		
					startle mitigation active (see startle mitigation active NOTE below)	= FALSE		
					clutch control solenoid test state	≠ TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	≠ TIE UP TEST HOLD		
					initialize active clutch controller (clutch control processing in process of sequencing clutches on	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		on test is disabled. This diagnostic monitor is relative to the GF9 C6 C6789, or, GR10 C6 C45678910R, clutch pressure control solenoid.			and off for auto trans shift)			
					(shift type enable for staged steady state shift - shift in process when new shift type occurs - interrupted shift	= 0 Boolean		
					OR			
					shift type enable for garage shift	= 0 Boolean		
					OR			
					shift type enable for negative torque up shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power on up shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle down shift	= 1 Boolean		
					OR			
					shift type enable for open throttle power down shift	= 1 Boolean		
					OR			
					shift type enable for closed throttle lift foot up shift)	= 0 Boolean		
					OR			
					clutch control solenoid test state	= TIE UP TEST TEST STATE		
					clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					transition clutch controller	= TRUE		
					active clutch controller (staged steady sate shift - shift not in process, no new shift type occuring, no interrupted shift)	≠ staged steady state		
					set clutch control solenoid test state to TIE UP TEST			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					TEST STATE when:			
					solenoid stuck on test trigger	= TRUE		
					current loop clutch control solenoid test state OR	= TEST WAITING		
					current loop clutch control solenoid test state (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					range shift state	≠ range shift complete		
					solenoid stuck on test trigger	= TRUE		
					additional off going clutch occured	= TRUE		
					(clutch control solenoid test state OR	= TIE UP TEST TEST STATE		
					clutch control solenoid test state) (see clutch control solenoid test state NOTE below)	= TIE UP TEST HOLD		
					diagnostic clutch test	= OFF GOING CLUTCH TEST		
					(C6 off going clutch pressure control ramp time out complete AND	= TRUE		
					off going clutch pressure ramp control ramp time out enable) OR	= 1 Boolean		
					C6 off going clutch pressure	≤ 350.0 kPa	for C6 off going clutch pressure time ≥ **P2733 C6 clutch exhaust delay time closed throttle lift foot up shift** OR	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							P2733 C6 clutch exhaust delay time open throttle power on up shift OR **P2733 C6 clutch exhaust delay time garage shift** OR **P2733 C6 clutch exhaust delay time closed throttle down shift** OR **P2733 C6 clutch exhaust delay time negative torque up shift** OR **P2733 C6 clutch exhaust delay time open throttle power down shift** see supporting tables	
					engine torque	≥ 8,191.8 Nm		
					primary on coming clutch active	= TRUE		
					primary on coming control state	≠ clutch fill phase		
					closed throttle lift foot up shift primary on coming clutch pressure OR	≥ 655.0 kPa		
					open throttle power on up shift primary on coming clutch pressure OR	≥ 655.0 kPA		
					garage shift primary on	≥ 750.0 kPa		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					coming clutch pressure OR			
					negative torque up shift primary on coming clutch pressure OR	≥ 655.0 kPa		
					open throttle power down shift primary on coming clutch pressure OR	≥ 655.0 kPa		
					closed throttle down shift primary on coming clutch pressure	≥ 655.0 kPa		
					C6 clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation	= TRUE		
					NOTE: Clutch control solenoid test state TIE UP TEST HOLD is necessary, as it is possible to have multiple off going clutches during one automatic transmission shift. Clutch control solenoid test state is set to TIE UP TEST HOLD during an automatic transmission shift due to two conditions: Current value of clutch control solenoid test state is TIE UP TEST TEST STATE, when one off going clutch pressure control solenoid stuck on diagnostic monitor is currently executing. AND			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					That off going clutch pressure control solenoid stuck on diagnostic monitor currently executing passes, the corresponding clutch slip speed ≥ clutch slip speed fail threshold. Once clutch control solenoid test state is set to TIE UP TEST HOLD, it remains TIE UP TEST HOLD during the automatic transmission shift, until: An additional off going clutch occurs, as indicated by solenoid stuck on test trigger = TRUE, subsequently clutch control solenoid test state is reset to TIE UP TEST TEST STATE, to allow the additional corresponding off going clutch pressure control solenoid stuck on diagnostic monitor to execute. OR The automatic transmission shift completes, range shift state = range shift complete. NOTE: Startle mitigation is used to detect unintended vehicle deceleration due to a clutch pressure control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					solenoid stuck on failure mode that occurs during steady state gear, not during an automatic transmission shift. The startle mitigation active then forces the transmission clutch pressure control system to a safe gear or neutral state, based on the active and inactive clutches, when the unintended vehicle deceleration occurred. Once a safe vehicle gear state is attained, the gear and clutch pressure control system allows transitions of the clutches on and off, to sequence automatic transmission shifts, single step shifts. As each single step automatic transmission shift occurs the normal pressure control solenoid stuck on diagnostic monitors execute to verify which clutch pressure control solenoid is in the stuck on failure mode, allowing one of the clutch pressure control solenoid stuck on DTCs to set P0747, P0777, P0797, P2715, P2724, P2733, P2821.			
					DTCs not fault pending	P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not test fail this key on	P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821		
					DTCs not fault active	AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid F Control Circuit Open	P2736	Controller specific circuit diagnoses 9 speed C6789 or 10 speed C45678910R clutch solenoid for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 F Control Circuit Low	P2738	Controller specific circuit diagnoses 9 speed C6789 or 10 speed C45678910R clutch solenoid for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 F Control Circuit High	P2739	Controller specific circuit diagnoses 9 speed C6789 or 10 speed C45678910R clutch solenoid for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Calibration Incorrect	P27A7	The diagnostic monitor verifies that the pressure control solenoid A (GF9 line pressure or GR10 C1 C123456R clutch) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid A electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid B Calibration Incorrect	P27A8	The diagnostic monitor verifies that the pressure control solenoid B (GF9 TCC pressure or GR10 C2 C128910R clutch) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid B electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power event during the controller initialization before normal time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid C Calibration Incorrect	P27A9	The diagnostic monitor verifies that the pressure control solenoid C (GF9 C1 CB123456 clutch or GR10 C3 C23457910 clutch) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid C electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid D Calibration Incorrect	P27AA	The diagnostic monitor verifies that the pressure control solenoid D (GF9 C2 CB29 clutch or GR10 C5 C1356789 clutch) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid D electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid E Calibration Incorrect	P27AB	The diagnostic monitor verifies that the pressure control solenoid E (GF9 C3 CB38 clutch or GR10 C4 C23467810R clutch) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid E electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid F Calibration Incorrect	P27AC	The diagnostic monitor verifies that the pressure control solenoid F (GF9 C4 C4 clutch or GR10 C6 C45678910R clutch) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid F electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid G Calibration Incorrect	P27AD	The diagnostic monitor verifies that the pressure control solenoid G (GF9 C5 C57R clutch or GR10 line pressure) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid G electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid H Calibration Incorrect	P27AE	The diagnostic monitor verifies that the pressure control solenoid H (GF9 C6 C6789 clutch or GR10 TCC) characterization data is programmed correctly into the TCM EEPROM to match the pressure control solenoid H electrical characteristics of the device currently installed in the transmission valve body assembly.	pressure control solenoid characterization data programming complete Matching is defined as pressure control solenoid characterization data corresponding to the transmission valve body assembly componentry. pressure control solenoid characterization data programming complete is set to FALSE when any of the following is present: Solenoid data is not programmed or incomplete data fault - occurs when a new or service TCM is installed. OR Solenoid class programming fault – the characterization data indicates a different type of device than the TCM calibration data OR Checksum mismatch – the checksum that was calculated from the programmed pressure control solenoid characterization data region does not match the calculated valve at the time of programming. OR Axis data fault – pressure	= FALSE	Pressure control solenoid characterization data is programmed originally at vehicle plant assembly based on transmission valve body assembly part number associated to the unit installed in vehicle. When valve body is serviced, dealership performs reprogramming of TCM with pressure control solenoid characterization data based on the associated transmission valve body part number installed.		execution of monitor occurs once per controller normal power up event during the controller initialization before normal controller time loop execution	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			control solenoid characterization data has one or more points that are less than the previous match point, axis data must be greater than or equal to previous data values.					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control A Position Sensor/ Switch Circuit/Open	P27EB	The diagnostic monitor detects an illegal voltage on the mode valve A position sensor circuit.	raw sensor voltage raw sensor voltage	> 1.263 volts < 1.504 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control A Position Sensor/ Switch Circuit Range/ Performance	P27EC	Sensor signal fails to transition when solenoid mode valve control commands to PARK, DRIVE or REVERSE occur.	when: (ETRS command direction mode valve delay time out of park state) OR (ETRS command direction mode valve delay time out of park state turbine speed) OR (ETRS command direction mode valve delay time out of park state turbine speed) OR (ETRS command direction mode valve delay time out of park state) set sensor fault to TRUE	= PARK ≥ **KtPSDR_t_ParkStatDlyLim** = PARK = DRIVE ≥ **KtPSDR_t_ParkStatDlyLim** = OUT OF PARK ≤ 400 RPM = REVERSE ≥ **KtPSDR_t_ParkStatDlyLim** = OUT OF PARK ≤ 400 RPM = REVERSE ≥ **KtPSDR_t_ParkStatDlyLim** ≠ OUT OF PARK	park servo enable ETRS system type is internal ETRS battery voltage for battery voltage time (engine mode run OR hydraulic pressure available) auto stop active diagnostic monitor enable hydraulic pressure available = TRUE when: engine speed for engine speed time otherwise hydraulic pressure available = FALSE hydraulic pressure available ETRS diagnostic range P27EE fault active P27EB fault active P27ED fault active P0968 fault active P0970 fault active P0971 fault active P18AB test fail this key on P18AA test fail this key on P27EC test fail this key on mode valve A state hydraulic pressure available	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.000 seconds = TRUE = TRUE = FALSE = 1 Boolean ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** = TRUE = ETRS command direction = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE ≠ **KaPSDR_e_GFX_ModeVlvA_StFnl** = TRUE	set sensor fault = TRUE, set DTC fault active update rate 6.25 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			otherwise set sensor fault to FALSE		set mode valve delay time enable = TRUE when none of the following occur: [ETRS mode enable valve state OR (C3 clutch pressure AND ETRS drive latch present) AND (ETRS command direction OR ETRS command direction)] OR [(ETRS command direction OR ETRS command direction OR ETRS command direction OR ETRS command direction) AND C3 clutch pressure] update mode valve delay time when mode valve delay time enable update mode valve steady state fail when: mode valve delay time enable mode valve delay time	 = ETRS zero limit (hydraulic cicruit exhausted) < 195.0 kPa = FALSE = DRIVE = NEUTRAL SHIFT = PARK = REVERSE = NEUTRAL LO = NEUTRAL HI > 25.0 kPa = FALSE = FALSE ≥ **KtPSDR_t_ParkStatDlyLim**		
			when: (ETRS command direction ETRS mode enable valve	 = PARK ≠ ETRS zero limit	park servo enable ETRS system type is internal ETRS	= 1 Boolean = CeTRGR_e_InternalETRS	set sensor fault = TRUE, set DTC fault active	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			state out of park state) OR (ETRS command direction ETRS diagnostic range out of park state) set sensor fault to TRUE otherwise set sensor fault to FALSE	(hydraulic cicruit exhausted) = PARK = DRIVE = PARK = OUT OF PARK	battery voltage for battery voltage time (engine mode run OR hydraulic pressure available) auto stop active diagnostic monitor enable hydraulic pressure available = TRUE when: engine speed for engine speed time otherwise hydraulic pressure available = FALSE ETRS diagnostic range (range command actuator AND park not available) OR (range command actuator OR range command actuator OR range command actuator OR range command actuator) out of park not avaliable ETRS command direction previous set mode valve stuck on test to TRUE when: ETRS command direction ETRS diagnostic range diagnostic monitor enable transmission fluid temperature	≥ 9.00 volts ≥ 1.000 seconds = TRUE = TRUE = FALSE = 1 Boolean ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** ≠ ETRS command direction = PARK = FALSE = DRIVE = NEUTRAL = MANUAL = REVERSE = FALSE ≠ ETRS command direction = PARK = DRIVE = 1 boolean ≥ 0.00 °C	update rate 6.25 milliseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					transmission fluid temperature	≤ 255.99 °C		
					P0962, P0968, P0970, P0971, P2718, P2720, P2721, P2812, P2815, P2738 Fault Active	= FALSE		
					P27EC, P27F0 Fault Pending	= FALSE		
					P18AA, P18AB, P18AE, P27EC Test Fail This Key On	= FALSE		
					P27EB, P27ED, P27EE Fault Active	= FALSE		
					otherwise set mode valve stuck on test to FALSE			
					(mode valve stuck on test	= FALSE		
					P18AF test fail this key on	= FALSE		
					P27EE fault active	= FALSE		
					P27EB fault active	= FALSE		
					P27ED fault active	= FALSE		
					P0968 fault active	= FALSE		
					P0970 fault active	= FALSE		
					P0971 fault active	= FALSE		
					P18AB test fail this key on	= FALSE		
					P18AA test fail this key on	= FALSE		
					P27EC test fail this key on)	= FALSE		
					hydraulic pressure available	= TRUE		
					ETRS command direction	= ETRS command direction previous		
					mode valve A state attained	= FALSE		
					mode valve A transition	= FALSE		
					((ETRS diagnostic range OR	= NEUTRAL SHIFT		
					mode valve B transition OR	= TRUE		
					mode valve B state	= TRUE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					attained) OR (ETRS mode enable valve state AND ETRS diagnostic range)) [(mode valve A transition mode valve A garage shift transition delay) OR mode valve A garage shift transition delay]	 = ETRS zero limit (hydraulic cicruit exhausted) = DRIVE = FALSE ≥ KaPSDR_t_GFX_ModeVlvA_TrnstnDly[ETRS attained range, ETRS command range] see supporting tables > 0.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control A Position Sensor/ Switch Circuit Low	P27ED	The diagnostic monitor detects a ground short or open circuit fault on the mode valve A position sensor circuit.	raw sensor voltage	< 0.414 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control A Position Sensor/ Switch Circuit High	P27EE	The diagnostic monitor detects a short to voltage on the mode valve A position sensor circuit.	raw sensor voltage	> 2.538 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control B Position Sensor/ Switch Circuit/Open	P27EF	The diagnostic monitor detects an illegal voltage on the mode valve B position sensor circuit.	raw sensor voltage raw sensor voltage	> 1.263 volts < 1.504 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control B Position Sensor/ Switch Circuit Range/ Performance	P27F0	Sensor signal fails to transition when solenoid mode valve control commands to PARK, REVERSE, NEUTRAL HI, NEUTRAL LO, NEUTRAL SHIFT or DRIVE occur.	when: (ETRS command direction mode valve delay time out of park state) OR (ETRS command direction mode valve delay time out of park state turbine speed) OR (ETRS command direction mode valve delay time out of park state turbine speed) OR (ETRS command direction mode valve delay time out of park state) set sensor fault to TRUE	= PARK ≥ **KtPSDR_t_ParkStatDlyLim** = PARK = REVERSE ≥ **KtPSDR_t_ParkStatDlyLim** = OUT OF PARK ≤ 400 RPM = DRIVE ≥ **KtPSDR_t_ParkStatDlyLim** = OUT OF PARK ≤ 400 RPM = NEUTRAL LO ≥ **KtPSDR_t_ParkStatDlyLim** ≠ OUT OF PARK	park servo enable ETRS system type is internal ETRS battery voltage for battery voltage time (engine mode run OR hydraulic pressure available) auto stop active diagnostic monitor enable hydraulic pressure available = TRUE when: engine speed for engine speed time otherwise hydraulic pressure available = FALSE ETRS diagnostic range P27F2 fault active P27EF fault active P27F1 fault active P2718 fault active P2720 fault active P2721 fault active P18AD test fail this key on P18AC test fail this key on P27F0 test fail this key on mode valve A state hydraulic pressure available set mode valve delay time enable = TRUE when any	= 1 Boolean = CeTRGR_e_InternalETRS ≥ 9.00 volts ≥ 1.000 seconds = TRUE = TRUE = FALSE = 1 Boolean ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** = ETRS command direction = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE ≠ **KaPSDR_e_GFX_ModeVlvA_StFnl** = TRUE	set sensor fault = TRUE, set DTC fault active update rate 6.25 milliseconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			otherwise set sensor fault to FALSE		of the following occur: [(ETRS command direction OR ETRS command direction OR ETRS command direction) AND (ETRS mode enable valve state OR C4 clutch pressure)] OR [(ETRS command direction OR ETRS command direction OR ETRS command direction) AND C4 clutch pressure] otherwise set mode valve delay time enable = FALSE update mode valve delay time when mode valve delay time enable update mode valve steady state fail when: mode valve delay time enable mode valve delay time	 = REVERSE = NEUTRAL HI = NEUTRAL LO = ETRS zero limit (hydraulic cicruit exhausted) < 295.0 kPa = DRIVE = PARK = NEUTRAL LO > 25.0 kPa = FALSE = FALSE ≥ **KtPSDR_t_ParkStatDlyLim**		
			when: (ETRS command direction ETRS mode enable valve state	 = PARK ≠ ETRS zero limit (hydraulic cicruit	park servo enable ETRS system type is internal ETRS	= 1 Boolean = CeTRGR_e_InternalETRS	set sensor fault = TRUE, set DTC fault active update rate 6.25	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
			 out of park state) OR (ETRS command direction ETRS diagnostic range out of park state) OR [(ETRS command direction OR ETRS command direction OR ETRS command direction) AND (ETRS diagnostic range AND out of park state) set sensor fault to TRUE otherwise set sensor fault to FALSE	exhausted) = PARK = REVERSE = PARK = OUT OF PARK = NEUTRAL LO = NEUTRAL HI = NEUTRAL SHIFT = PARK = OUT OF PARK	battery voltage for battery voltage time (engine mode run OR hydraulic pressure available) auto stop active diagnostic monitor enable hydraulic pressure available = TRUE when: engine speed for engine speed time otherwise hydraulic pressure available = FALSE ETRS diagnostic range (range command actuator AND park not available) OR (range command actuator OR range command actuator OR range command actuator OR range command actuator) out of park not avaliable set mode valve stuck on test to TRUE when: ETRS command direction ETRS diagnostic range diagnostic monitor enable transmission fluid temperature transmission fluid temperature P0962, P0968, P0970, P0971, P2718, P2720,	≥ 9.00 volts ≥ 1.000 seconds = TRUE = TRUE = FALSE = 1 Boolean ≥ 400.0 RPM ≥ **KtTMDC_t_EngOnHydPresThrsh** ≠ ETRS command direction = PARK = FALSE = DRIVE = NEUTRAL = MANUAL = REVERSE = FALSE = PARK = DRIVE = 1 boolean ≥ 0.00 °C ≤ 255.99 °C = FALSE	milliseconds	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P2721, P2812, P2815, P2738 Fault Active			
					P27EC, P27F0 Fault Pending	= FALSE		
					P18AA, P18AB, P18AE, P27EC Test Fail This Key On	= FALSE		
					P27EB, P27ED, P27EE Fault Active	= FALSE		
					otherwise set mode valve stuck on test to FALSE			
					(mode valve stuck on test	= FALSE		
					P18AF test fail this key on	= FALSE		
					P27F2 fault active	= FALSE		
					P27EF fault active	= FALSE		
					P27F1 fault active	= FALSE		
					P2718 fault active	= FALSE		
					P2720 fault active	= FALSE		
					P2721 fault active	= FALSE		
					P18AD test fail this key on	= FALSE		
					P18AC test fail this key on	= FALSE		
					P27F0 test fail this key on)	= FALSE		
					hydraulic pressure available	= TRUE		
					ETRS command direction	= ETRS command direction previous		
					mode valve B state attained	= FALSE		
					mode valve B transition	= FALSE		
					((ETRS diagnostic range OR	≠ NEUTRAL SHIFT		
					mode valve A transition OR	= TRUE		
					mode valve B state attained)	= TRUE		
					delete			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					OR (ETRS mode enable valve state AND ETRS diagnostic range)) delete when: (ETRS command direction AND ETRS command direction) AND mode valve B sensor performance fault pending mode valve B transition fail count update mode valve B garage shift fail time when: mode valve B garage shift fail time AND mode valve B garage shift transition update mode valve B garage shift transition delay [(mode valve B transition mode valve B garage shift transition delay) OR mode valve B garage shift fail time]	 = ETRS zero limit (hydraulic cicruit exhausted) = DRIVE ≠ PARK ≠ NEUTRAL LO = TRUE = 0 counts > 0.0 seconds = FALSE = FALSE ≥ KaPSDR_t_GFX_ModeVlvB_TrnstnDly[ETRS attained range, ETRS command range] see supporting tables > 0.0 seconds		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control B Position Sensor/ Switch Circuit Low	P27F1	The diagnostic monitor detects a ground short or open circuit fault on the mode valve B position sensor circuit.	raw sensor voltage	> 0.414 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Transmission Range Control B Position Sensor/ Switch Circuit High	P27F2	The diagnostic monitor detects a short to voltage on the mode valve B position sensor circuit.	raw sensor voltage	> 2.538 volts	diagnostic monitor enable battery voltage battery voltage time ETRS system configuration is internal ERTS park sensor configuration type is hall sensor	= 1 Boolean ≥ 9.00 volts ≥ 1.00 seconds = CeTRGR_e_InternalETRS = CePSCR_e_HallSns	0.100 seconds in 0.163 second sample 6.25 millisecond update rate	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control (PC) Solenoid G Control Circuit Open	P2812	Controller specific circuit diagnoses 9 speed Line Pressure Control Circuit or 10 speed Line Pressure Control Circuit for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 G Control Circuit Low	P2814	Controller specific circuit diagnoses 9 speed Line Pressure Circuit or 10 speed Line Pressure Circuit for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 G Control Circuit High	P2815	Controller specific circuit diagnoses 9 speed Line Pressure Circuit or 10 speed Line Pressure Circuit for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Solenoid H Performance /Stuck Off	P2817	The diagnostic monitor detects the transmission torque converter control valve solenoid failed hydraulically off. The monitor executes when the transmission torque converter is commanded to a “lock” mode during which the torque converter will be controlled to near zero (0.0) RPM slip speed, or, an “on” mode during which the torque converter will be controlled to target slip speed using slip speed error. The transmission torque converter control valve solenoid is considered failed hydraulically off when the “lock” mode slip speed is excessive, or, when the ‘on” mode slip speed error is excessive.	if use TCC slip speed error OR TCC control mode TCC slip speed error = TCC slip speed - TCC comand slip speed else if TCC control mode torque convert slip = engine speed - transmission input shaft speed then update fail time 25 millisecond update rate	= 0 Boolean = ON mode (controlled slip mode) ≥ **P2817 TCC stuck off fail TCC slip speed** see supporting table = LOCK ≥ 130.0 RPM	diagnostic monitor enable TCC command capacity TCC command pressure (TCC control mode previous TCC control mode previous TCC control mode previous) AND (TCC control mode current OR TCC control mode current) (TCC stuck off enable OR TCC stuck on enable) hydraulic pressure available: engine speed	= 1 Boolean ≥ 0.00 % ≥ 800.0 kPa ≠ TCC control mode current ≠ ON mode (controlled slip mode) ≠ LOCK = ON mode (controlled slip mode) = LOCK = 1 Boolean = 1 Boolean ≥ 400.0 RPM	fail time ≥ 2.500 seconds increment fail count fail count ≥ 3 counts 25 millisecond update rate TCC command capacity time ≥ 0.00 seconds TCC command pressure time ≥ 2.00 seconds engine speed time ≥ **engine speed time for transmission hydraulic pressure available**	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
							see supporting table	
					service fast learn active	= FALSE		
					battery voltage	≥ 9.00 volts	battery voltage time ≥ 0.100 seconds	
					run crank voltage	≥ 9.00 volts	run crank voltage time ≥ 0.100 seconds	
					P281B falut active	= FALSE		
					P281D falut active	= FALSE		
					P281E falut active	= FALSE		
					P0722 fault pending	= FALSE		
					P0723 fault pending	= FALSE		
					P0716 fault pending	= FALSE		
					P0717 fault pending	= FALSE		
					P07BF fault pending	= FALSE		
					P07C0 fault pending	= FALSE		
					(PTO active OR	= FALSE		
					PTO disable calibration)	= 1 Boolean		
					accelerator pedal position	≥ 8.0 %		
					accelerator pedal position	≤ 100.0 %		
					range shift state	= range shift complete		
					transmission fluid temperature	≥ -6.66 °C		
					transmission fluid temperature	≤ 130.0 °C		
					engine torque	≥ 50.0 Nm		
					engine torque	≤ 8,191.8 Nm		
					P2817 test fail this key on	= FALSE		
					(TCC control mode OR	= ON mode (controlled slip mode)		
					TCC control mode)	= LOCK		
					break latch state (clutch select valve solenoid)	= disabled (clutch select valve not transitioning)		
					attained gear	≥ CeCGSR_e_CR_Third		
					attained gear slip	≤ 25 RPM		
					DTCs not fault active	AcceleratorPedalFailure EngineTorqueEstInaccurate		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P0716, P0717, P07BF, P07C0 P0722, P0723, P077C, P077D		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control Solenoid H Stuck On - GF9 specific	P2818	The diagnostic monitor detects the transmission torque converter control valve solenoid failed hydraulically on. The torque converter hydraulic control circuit is multiplexed with the transmission clutch select valve hydraulic control circuit, allowing for the torque converter control valve solenoid stuck on test to execute when the clutch select valve solenoid is commanded ON. When the clutch select valve solenoid is commanded ON as the vehicle speed decreases toward zero KPH, and, if the torque converter control valve solenoid is stuck on, the torque converter slip speed rate of change will have a large slope while decreasing toward zero RPM, and the torque converter slip speed will remain low near zero RPM.	while control valve test time timing down: rate of change of torque convert slip speed = (ABS (current loop value torque convert slip speed - previous loop value torque convert slip speed) / 25 milliseconds) when clutch select valve soleniod multiplexed to TCC hydraulic AND torque convert slip speed = ABS(engine speed - transmission input shaft speed) AND torque convert slip speed = engine speed - transmission input shaft speed torque convert slip speed torque convert slip speed THEN increment fail time 25 millisecond update rate	≥ **P2818 torque convert derivative slip speed fail threshold** see supporting table ≤ **P0741 (GF9 specific) TCC slip speed crash RPM** ≥ -50.0 RPM ≤ 30.0 RPM	diagnostic monitor enable (TCC stuck off enable OR TCC stuck on enable) hydraulic pressure available: engine speed service fast learn active battery voltage run crank voltage P281B falut active P281D falut active P281E falut active PRNDL PRNDL transmission fluid temperature transmission fluid	= 1 Boolean = 1 Boolean = 1 Boolean ≥ 400.0 RPM = FALSE ≥ 9.00 volts ≥ 9.00 volts = FALSE = FALSE = FALSE ≠ NEUTRAL ≠ REVERSE ≥ -6.66 °C ≤ 130.00 °C	fail time ≥ 1.500 seconds increment fail count fail count ≥ 4 counts 25 millisecond update rate engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supportinf table battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					temperature			
					accelerator pedal position	≥ 0.00 %		
					accelerator pedal position	≤ 1.00 %		
					vehicle speed	≥ 3.0 KPH		
					vehicle speed	≤ 9.5 KPH		
					TCC command mode	= OFF		
					break latch state (clutch select valve solenoid)	≠ disabled (clutch select valve transitioning)		
					P0722 fault pending	= FALSE		
					P0723 fault pending	= FALSE		
					P0716 fault pending	= FALSE		
					P0717 fault pending	= FALSE		
					P07BF fault pending	= FALSE		
					P07C0 fault pending	= FALSE		
					(PTO active OR	= FALSE		
					PTO disable calibration)	= 1 Boolean		
					transmission fluid temperature	≥ -6.66 °C		
					transmission fluid temperature	≤ 130.00 °C		
					engine torque	≥ 55.0 Nm		
					engine torque	≤ 800.0 Nm		
					P2818 test fail this key on	= FALSE		
					vehicle speed	≤ 45.0 KPH		
					engine speed	≥ 400.0 RPM		
					engine speed	≤ 5,500.0 RPM		
					accelerator pedal position	≤ 95.0 %		
					4WD low state	= FALSE		
					(driver shift mode active OR	= FALSE		
					driver shift mode calibration)	= 0 Boolean		
					(misfire requests TCC off OR	= FALSE		
					misfire TCC off calibration)	= 0 Boolean		
					(clucth control solenoid stuck on OR stuck OFF intrusive shift active)	= FALSE		
					P0746 fault pending	= FALSE		
					P0747 fault pending	= FALSE		
					P0776 fault pending	= FALSE		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P0777 fault pending P0796 fault pending P0797 fault pending P2714 fault pending P2715 fault pending P2723 fault pending P2724 fault pending P2732 fault pending P2733 fault pending P2820 fault pending P2821 fault pending vehicle speed accelerator pedal position hysteresis when: break latch state (clutch select valve solenoid) previous break latch state (clutch select valve solenoid) set stuck on test time and begin time down, stuck on test time must time down from calibration value to zero (0.0) seconds break latch state (clutch select valve solenoid) AND previous break latch state (clutch select valve solenoid) THEN initialize control valve test time, control valve test time must time down from calibration value to zero (0.0) seconds	= FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE = FALSE ≤ 8.0 KPH ≥ 4.0 % > 1.0 % = disabled (clutch select valve not transitioning) = complete (clutch select valve transition complete) = **P2818 stuck on test time** see supporting tables = clutch select valve solenoid mutliplexed to TCC hydraulic = disabled (clutch select valve not transitioning) = **P2818 (GF9 specific) control valve test time** see supporting tables		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					DTCs not fault active	AcceleratorPedalFailure EngineTorqueEstInaccurate P0716, P0717, P07BF, P07C0 P0722, P0723, P077C, P077D		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control Solenoid H Control Circuit/Open	P281B	Controller specific circuit diagnoses 9 speed TCC Control Circuit or 10 speed TCC Control Circuit for an open circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates an open circuit Controller specific circuit voltage thresholds are set to meet the following controller specification for an open circuit Increment fail time	≥ 200 K Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Solenoid H Control Circuit Low	P281D	Controller specific circuit diagnoses 9 speed TCC Pressure Control Circuit or 10 speed TCC Control Circuit for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Solenoid H Control Circuit High	P281E	Controller specific circuit diagnoses 9 speed TCC Pressure Control Circuit or 10 speed TCC Control Circuit for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 J Stuck Off	P2820	Each pressure control solenoid stuck off diagnostic monitor detects a clutch pressure control solenoid failed hydraulically off, while the solenoid is electrically functional. This diagnostic monitor detects the clutch select valve solenoid failed hydraulically off. The clutch select valve is used to route hydraulic fluid to, either, the selectable one way clutch hydraulic circuit used to attain transmission 1st gear lock state, or, to the C6 - C6789 clutch hydraulic circuit necessary for transmission higher gear states. When the clutch select valve is failed hydraulically off, and transmission is in 1st gear lock state, it is possible to measure low C6 - C6789 clutch slip speed as hydraulic fluid is routed to the clutch C6 - C6789, or, 6th gear transmission gear ratio, based on transmission lever node design, the	gear ratio gear ratio OR C6 clutch slip speed, update fail time 6.25 milliscond update	≤ 1.700 ≥ 1.200 ≤ 20.0 RPM	use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled service fast learn active service solenoid cleaning procedure active hydraulic pressure	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean = TRUE Boolean = FALSE Boolean = FALSE Boolean	fail time ≥ 0.250 seconds, update fail count, fail count ≥ 3 counts 6.25 milliscond update battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 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 input shaft speed, the transmission output shaft speed, and one transmission intermediate shaft speed, while not commanding 6th-9th gear, as the indication of the failure mode. This diagnostic monitor is relative to the GF9 clutch select valve pressure control solenoid.			available: engine speed diagnostic monitor enabled transmission output shaft speed transmission fluid temperature transmission fluid temperature P2820 test fail this key on (command gear OR attained gear) DTCs not fault pending DTCs not test fail this key on DTCs not fault active	≥ 400.0 RPM = 1 Booelan ≥ 35 RPM ≥ -256.00 °C ≤ 130.0 °C = FALSE = 1st lock = 1st lock P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0 P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821 AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD	engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting table	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
						P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control Solenoid J Stuck On	P2821	Each pressure control solenoid stuck on diagnostic monitor detects a clutch pressure control solenoid failed hydraulically on, while the solenoid is electrically functional. The clutch select pressure control solenoid must be hydraulically off and the clutch select valve in the off state, to allow hydraulic fluid supply to the C3 (CB38) or C4 (C4) or C5 (C57R) clutches, such that when activated, commanded gear 3rd or 4th or 5th can be attained. With the clutch select valve pressure control solenoid failed hydraulically on, commanded gear 3rd or 4th or 5th cannot be attained. In the failure mode, the clutch slip speed, and gear box gear slip, will be excessive, not near or at zero RPM, when commanding 3rd or 4th or 5th gear, but due to the clutch select pressure control solenoid failed hydraulically on and not	Cx clutch slip speed fail compare C3 (CB38) OR C4 (C4) OR C5 (C57R) update Cx clutch slip speed fail time 6.25 milliscond update once intrusive gear is commanded and clutch select stuck on test active remains and Cx clutch fail count limit occurs, increment clutch select valve solenoid stuck on fail count and time up clutch select stuck on test gear time 6.25 milliscond update	 ≥ 200.0 RPM ≥ 200.0 RPM ≥ 200.0 RPM = TRUE			Cx clutch slip speed fail time ≥ C3 (CB38) 3.00 seconds OR C4 (C4) 3.00 seconds OR C5 (C57R) 3.00 seconds update Cx fail count, Cx fail count ≥ C3 (CB38) 3 counts OR C4 (C4) 3 counts OR C5 (C57R) 3 counts, Cx clutch fail count limit occurs 6.25 milliscond update clutch select valve solenoid stuck on fail count ≥ 2 counts OR clutch select stuck on test gear time ≥ 9.00 seconds 6.25 milliscond update	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		individual clutch control faults. It is thus necessary, when individual clutch slip occurs in 3rd or 4th or 5th gear and counted toward the clutch pressure control solenoid stuck on failure, for an intrusive gear commanded from 3rd or 4th or 5th to verify the clutch slip in the remaining gear states. The individual clutch slip that occurs in those intrusive gears, 3rd or 4th or 5th, is also counted toward the clutch pressure control solenoid stuck on failure. As individual clutch slip is accumulated in each commanded gear 3rd or 4th or 5th, that failure time is the verification of the clutch pressure control solenoid failed hydraulically on. The clutch slip speed is calculated based on the transmission lever node design, requiring transmission input shaft speed, transmission output shaft speed, and, one transmission intermediate shaft speed. The clutch			use battery voltage calibration is FALSE OR (use battery voltage calibration is TRUE AND battery voltage use run crank voltage calibration is FALSE OR (use run crank voltage calibration is TRUE AND run crank voltage TCM output driver high side driver 1, clutch pressure control solenoid driver circuit enabled TCM output driver high side driver 2, clutch pressure control solenoid driver circuit enabled service fast learn active service solenoid cleaning procedure active hydraulic pressure available: engine speed	= 1 Boolean = 1 Boolean ≥ 9.00 volts = 0 Boolean = 0 Boolean ≥ 9.00 volts = TRUE Boolean = TRUE Boolean = FALSE Boolean = FALSE Boolean ≥ 400.0 RPM	battery voltage time ≥ 0.100 seconds run crank voltage time ≥ 0.100 seconds engine speed time ≥ **engine speed time for transmission hydraulic pressure available** see supporting	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		pressure control solenoid is tested after an automatic transmission shift occurs and has been considered shift complete, or, steady state gear is deemed active, range shift complete. When the automatic transmission shift is complete, steady state gear is considered, the clutch pressure control solenoid is mapped to transmission line pressure control, which normally allows the clutch to maintain full torque holding capacity at the given engine crankshaft torque, to maintain true gear ratio. When the clutch select pressure control solenoid is failed hydraulically on, C3 (CB38) or C4 (C4) or C5 (C57R) clutches cannot maintain holding capacity at any engine crankshaft torque, and the clutch slip speed is uncontrollable. The clutch pressure control solenoid test is suspended if the higher level safety startle mitigation function is			diagnostic monitor enable P2821 test fail this key on test trigger set to TRUE: enable forward gear AND direction request OR enable reverse gear AND direction request current loop test trigger clutch control solenoid test state range shift state clutch solenoid test state set to NEUTRAL TEST when: test trigger initialize range shift complete time, when range shift state, range shift complete time must time down to zero when range shift complete Cx indicates any one of the 4 clutches: C3 (CB38) OR C4 (C4) OR C5 (C57R) enable Cx clutch slip speed fail compare when: diagnostic clutch test Cx ((startle mitigation active	= 1 Boolean = FALSE = 1 Boolean = forward gear = 0 Boolean = reverse gear = FALSE ≠ NEUTRAL TEST = range shift completed = TRUE ≠ range shift completed = HOLDING CLUTCH = FALSE	table initialize range shift complete time = 1.000 seconds, range shift complete time must time down to zero when range shift complete	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
		active. The safety startle mitigation function is triggered when a sudden vehicle deceleration occurs due to a clutch pressure control solenoid that has failed hydraulically on, while the solenoid is electrically functional, which, must take priority over this clutch select pressure control solenoid stuck off diagnostic monitor. All clutch pressure control solenoid stuck on/off diagnostic monitors are emission MIL DTCs. System voltage must be normal, all clutch pressure control solenoid driver circuits must be functional, no clutch pressure control solenoid electrical or performance faults can be present, and no speed sensor electrical or performance faults can be present, or the a clutch pressure control solenoid stuck off test is disabled. This diagnostic monitor is relative to the GF9 clutch select valve pressure control solenoid.			OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) unintended deceleration fault pending OR unintended deceleration fault pending enable FASLE (startle mitigation) clutch steady state adaptive active transmission output shaft speed Cx clutch slip speed valid, all speed sesnors are functional for lever node clucth slip speed calculation accelerator pedal position engine speed diagnostic clutch test Cx set to HOLDING CLUTCH when: clutch solenoid test state ((startle mitigation active OR (startle mitigation active AND startle mitigation gear)) (see startle mitigation active NOTE below) Cx clutch pressured map clutch select stuck on test	 = TRUE ≠ initial startle mitigation gear = FALSE = 0 Boolean = FALSE ≥ 89.0 RPM ≥ 2.00 % ≥ 1,500.0 RPM = NEUTRAL TEST = FALSE = TRUE ≠ initial startle mitigation gear = mapped to line pressure, Cx clutch pressure has transtioned from off-applying-applied		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					active set to TRUE when:			
					command gear	≠ REVERSE		
					clutch control solenoid test state	= NEUTRAL TEST		
					any Cx clutch fail count limit occurs			
					break latch state, clutch select valve hydraulic latch fluid is applied, hydraulic latch fluid force balance acts with clutch select valve return spring, to force the clutch select valve to the off postion in normal operation, allowing hydraulic fluid to C3 (CB38) C4 (C4) and C5 (C57R) clutches	= complete		
					clutch select stuck on test active	= TRUE		
					driver direction (PRNDL) change request,	= FALSE		
					select intrusive gear to verify clutch select valve solenoid when HOLDING CLUTCH:			
					C3 (CB38)	= CeCGSR_e_Fifth		
					C4 (C4)	= CeCGSR_e_Fifth		
					C5 (C57R)	= CeCGSR_e_Third		
					enable clutch select stuck on test gear time			
					NOTE: startle mitigation active is used to detect unintended deceleration due to clutch pressure control solenoid stuck on failure modes, the clutch pressure control solenoid stuck on DTCs being			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
					P0747 P0777 P0797 P2715 P2724 P2733 P2821 DTCs not fault pending DTCs not test fail this key on DTCs not fault active	 P0716 P0717 P0722 P0723 P077C P077D P07BF P07C0 P0707 P0708 P0746 P0747 P0776 P0777 P0796 P0797 P2714 P2715 P2723 P2724 P2732 P2733 P2820 P2821 AcceleratorPedalFailure CrankSensor_FA P0707 P0708 P0716 P0717 P07BF P07C0 P0722 P0723 P077C P077D P172A P172B P176B P176C P176D P17C5 P17CC P17CD P17CE P17D3 P17D6 P2805		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Pressure Control Solenoid J Control Circuit Low	P2826	Controller specific circuit diagnoses 9 speed Clutch Select Valve Control Circuit or 10 speed PISA Valve Control Circuit for a ground short circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a ground short Controller specific circuit voltage thresholds are set to meet the following controller specification for a ground short Increment fail time	≤ 0.5 Ω impedance between signal and controller ground	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	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 Solenoid J Control Circuit High	P2827	Controller specific circuit diagnoses 9 speed Clutch Valve Control Circuit or 10 speed PISA Valve Control Circuit for a short to voltage circuit failure by comparing a voltage measurement to controller specific voltage thresholds.	Voltage measurement outside of controller specific acceptable range indicates a short to voltage Controller specific circuit voltage thresholds are set to meet the following controller specification for a short to voltage Increment fail time	≤ 0.5 Ω impedance between signal and controller voltage source	battery voltage run crank voltage OR accessory voltage active diagnostic monitor enable calibration	≥ 9.00 volts and ≤ 32.00 volts ≥ 5.00 volts = TRUE = 1 Boolean	≥ 1.000 seconds 25 milliseconds 12.5 milliseconds fail time ≥ 0.300 seconds out of sample time ≥ 0.500 seconds	Type A, 1 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Engine Stall Prevention Active Signal Message Counter Incorrect	P30BD	The diagnostic monitor detects an alive rolling count error in the CAN frame containing the engine stall protection signal value.	rolling count value received from ECM and expected TCM calculated value not equal 50 millisecond update rate	= TRUE	10 millisecond update rate of enable conditions service mode $04 active battery voltage battery voltage time engine stall protection ECM frame recieved	 = FALSE ≥ 11.00 volts ≥ 300.000 seconds = TRUE	alive rolling count errors ≥ 10 out of 10 sample counts 50 millisecond update rate	Type B, 2 Trips

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Control Module Communication 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) 0.81 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 = 1 (1 indicates enabled) = Active > 11.00 Volts > 0.1625 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 ECM	U0100	This DTC monitors for a loss of communication with the engine control module	Message is not received from controller for Message $0BE Message $0C9 Message $18E Message $1A1 Message $1A3 Message $1AA Message $1BA Message $287 Message $3D1 Message $3E9 Message $4C1 Message $4C7 Message $4D1 Message $4F1 Message $589	 ≥ 0.50 seconds ≥ 0.50 seconds ≥ 0.50 seconds ≥ 0.50 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 seconds ≥ 12.00 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	 Not Active on Current Key Cycle Enabled Not Active Not Active > 6.41 Volts = run = 1 (1 indicates enabled) = Active > 11.00 Volts	Diagnostic runs in 12.5 ms loop	Type A, 1 Trips

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		
					U0100	Not Active on Current Key Cycle		
					ECM	is present on the bus		

2D Supporting Tables TCM

Table 1

Axis	0.00	64.00	128.00	192.00	256.00	320.00	384.00	448.00	512.00	N*m
Curve	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	RPM

Table 2

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.6000	1.1000	0.9500	0.8500	0.8500	seconds

Table 3

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.5500	1.0500	0.9000	0.8000	0.8000	seconds

Table 4

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.4000	0.9000	0.7500	0.6500	0.6500	seconds

Table 5

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.5500	1.0500	1.0000	1.0000	1.0000	seconds

Table 6

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.5500	1.0500	0.9000	0.8000	0.8000	seconds

Table 7

Axis	_e_CD_21	R_e_CD_31	_e_CD_32	_e_CD_42	_e_CD_43	_e_CD_51	_e_CD_53	_e_CD_54	_e_CD_63	closed throttle down shift type: 2-1, 3-1, 3-2, 4-2, 4-3, 5-1, 5-3, 5-4, 6-3, 6-4, 6-5, 7-1, 7-,5 7-6, 8-2, 8-4, 8-6, 8-7
Curve	750.0	750.0	750.0	750.0	750.0	750.0	750.0	750.0	750.0	kPa
Axis	_e_CD_64	R_e_CD_65	_e_CD_71	_e_CD_75	_e_CD_76	_e_CD_82	_e_CD_84	_e_CD_86	_e_CD_87	closed throttle down shift type: 2-1, 3-1, 3-2, 4-2, 4-3, 5-1, 5-3, 5-4, 6-3, 6-4, 6-5, 7-1, 7-,5 7-6, 8-2, 8-4, 8-6, 8-7
Curve	750.0	750.0	750.0	750.0	750.0	750.0	750.0	750.0	750.0	kPa

Table 8

Axis	_e_US_12	R_e_US_23	_e_US_34	_e_US_45	_e_US_56	_e_US_67	_e_US_78	_e_US_13	_e_US_24	up shift type: 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 1-3, 2-4, 3-5, 4-6, 5-7, 6-8
Curve	750.0	750.0	750.0	750.0	750.0	750.0	750.0	750.0	750.0	kPa
Axis	_e_US_35	R_e_US_46	_e_US_57	_e_US_68	up shift type: 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 1-3, 2-4, 3-5, 4-6, 5-7, 6-8					
Curve	750.0	750.0	750.0	750.0	kPa					

Table 9

Axis	-6.67	-6.66	40.00	80.00	120.00	ºC
Curve	409.00	3.30	1.30	1.20	1.10	Sec

Table 10

Axis	C1_Clutch	e_C2_Clutch	C3_Clutch	_C4_Clutch	C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	1	1	1	1	1	BOOLEAN

2D Supporting Tables TCM

Table 11

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	180.0	180.0	180.0	180.0	180.0	N*m

Table 12

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	60.0	60.0	60.0	60.0	60.0	N*m

Table 13

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	10.0	10.0	10.0	10.0	10.0	N*m

Table 14

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	-30.0	-30.0	-30.0	-30.0	-30.0	N*m

Table 15

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	100.0	100.0	100.0	100.0	100.0	N*m

Table 16

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	60.0	60.0	60.0	60.0	60.0	N*m

Table 17

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	10.0	10.0	10.0	10.0	10.0	N*m

Table 18

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	-30.0	-30.0	-30.0	-30.0	-30.0	N*m

Table 19

Axis	-40.10	-40.00	-20.00	0.00	30.00	60.00	100.00	149.00	149.10	ºC
Curve	256.00	50.00	45.00	40.00	34.00	25.00	20.00	20.00	256.00	ºC

Table 20

Axis	-40.10	-40.00	-20.00	0.00	30.00	60.00	100.00	149.00	149.10	ºC
Curve	256.00	10.00	8.00	8.00	8.00	8.00	8.00	8.00	256.00	ºC

2D Supporting Tables TCM

Table 21

Axis	-40.00	0.00	40.00	ºC
Curve	5.00	5.00	5.00	Sec

Table 22

Axis	-6.67	-6.66	40.00	ºC
Curve	8191.75	8191.75	8191.75	RPM/Sec

Table 23

Axis	-6.67	-6.66	40.00	ºC
Curve	8191.75	8191.75	8191.75	RPM/Sec

Table 24

Axis	-7.00	10.00	40.00	ºC
Curve	1.50	1.25	1.00	Sec

Table 25

Axis	-7.00	10.00	40.00	ºC
Curve	-2000.00	-2000.00	-2000.00	RPM/Sec

Table 26

Axis	-40.00	-30.00	-20.00	0.00	20.00	ºC
Curve	1800.00	1500.00	1200.00	600.00	60.00	Sec

Table 27

Axis	0.00	20.00	60.00	100.00	120.00	Kph
Curve	-8.00	-8.00	-8.00	-8.00	-8.00	ºC

Table 28

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	5.00	3.00	2.00	1.75	1.00	Sec

Table 29

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	0.9000	0.9000	0.9000	0.9000	0.9000	seconds

Table 30

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	0.9000	0.9000	0.9000	0.9000	0.9000	seconds

2D Supporting Tables TCM

Table 31

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	0.9000	0.9000	0.9000	0.9000	0.9000	seconds

Table 32

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	4	4	4	4	4	counts

Table 33

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	4	4	4	4	4	counts

Table 34

NOT USED
NOT USED

Table 35

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	0.5000	0.5000	0.5000	0.5000	0.5000	seconds

Table 36

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	0.5000	0.5000	0.5000	0.5000	0.5000	seconds

Table 37

Axis	_C1_Clutch	e_C2_Clutch	_C3_Clutch	_C4_Clutch	_C5_Clutch	clutch1 CB1278R, clutch 2 CB12345R, clutch3 C13567, clutch4 C23468, clutch5 C45678R
Curve	300.0	300.0	300.0	300.0	300.0	kPa

Table 38

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	0.9500	0.4500	0.3000	0.3000	0.3000	seconds

Table 39

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	0.9500	0.4500	0.3000	0.2000	0.2000	seconds

Table 40

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	0.9500	0.4500	0.3000	0.2000	0.2000	seconds

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Table 41

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.1000	0.6000	0.5500	0.5500	0.5500	seconds

Table 42

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	0.9500	0.4500	0.3000	0.2000	0.2000	seconds

Table 43

NOT USED
NOT USED

Table 44

NOT USED
NOT USED

Table 45

Axis	_e_CC_US	R_e_CC_CD	_e_CC_PD	_e_CC_GS	up shift, closed throttle down shift, power down shift, garage shift
Curve	1	1	1	0	BOOLEAN

Table 46

Axis	0	1	2	3	1 ADchannel, 2 AD channels, 3 AD channels, 4 AD channels
Curve	1	0	0	0	BOOLEAN

Table 47

Axis	estVoltage1	TestVoltage2	estVoltage3	estVoltage4	1 ADchannel, 2 AD channels, 3 AD channels, 4 AD channels
Curve	5.0000	25.0000	75.0000	95.0000	volts

Table 48

Axis	p25msSeq	_12.5msSeq	_25msSeq	_LORES_C	6.25 msec loop, 12.5 msec loop, 25 msec loop, low res engine
Curve	0.2000	0.2000	0.2000	409.5938	seconds

Table 49

Axis	p25msSeq	_12.5msSeq	_25msSeq	_LORES_C	6.25 msec loop, 12.5 msec loop, 25 msec loop, low res engine
Curve	16	8	4	16	counts

Table 50

Axis	R_i_MontrA	IR_i_MontrB	R_i_MontrC	seed key test enable, seed sequence test enable, seed timeout test enable
Curve	1	0	0	BOOLEAN

Table 51

Axis	0	1	speed sensor1, speed sensor2
Curve	0.2500	0.0000	volts

Table 52

Axis	0	1	speed sensor1, speed sensor2
Curve	40	65535	counts

2D Supporting Tables TCM

Table 53

Axis	0	1	speed sensor1, speed sensor2
Curve	0.0500	409.5938	seconds

Table 54

Axis	0	1	speed sensor1, speed sensor2
Curve	1	0	BOOLEAN

Table 55

Axis	0	1	speed sensor1, speed sensor2
Curve	4.7500	12.0000	volts

Table 56

Axis	0	1	speed sensor1, speed sensor2
Curve	40	65535	counts

Table 57

Axis	0	1	speed sensor1, speed sensor2
Curve	0.0500	409.5938	seconds

Table 58

Axis	0	1	speed sensor circuit low, speed sensor circuit high
Curve	1	0	BOOLEAN

Table 59

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.2000	0.9000	0.8500	0.7500	0.7500	seconds

Table 60

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.2500	0.7500	0.6000	0.6000	0.6000	seconds

Table 61

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.2000	0.7000	0.5500	0.4500	0.4500	seconds

Table 62

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.2000	0.7000	0.5500	0.5500	0.5500	seconds

Table 63

Axis	-40.00	-20.00	0.00	30.00	110.00	ºC
Curve	1.2000	0.7000	0.5500	0.4500	0.4500	seconds

2D Supporting Tables TCM

Table 64

Axis	0BE_BusA	GACY_BusA	_0C1_BusA	_0C5_BusA	_0C9_BusA	_0F1_BusA	_CA_BusA	_12A_BusA	_185_BusA	frame
Curve	BusA_ECM	alidRxDevice	BusA_ABS	BusA_ABS	BusA_ECM	BusA_BCM	idRxDevice	BusA_BCM	idRxDevice	enable or invalid
Axis	_18E_BusA	GACY_BusA	_191_BusA	_1A1_BusA	_1A3_BusA	_1A5_BusA	1AA_BusA	ACY_BusA	1BA_BusA	frame
Curve	BusA_ECM	alidRxDevice	idRxDevice	BusA_ECM	BusA_ECM	idRxDevice	BusA_ECM	idRxDevice	BusA_ECM	enable or invalid
Axis	1CB_BusA	g_1DF_BusA	_1E9_BusA	_1F1_BusA	_1F3_BusA	_1F9_BusA	1FC_BusA	_287_BusA	2D1_BusA	frame
Curve	idRxDevice	alidRxDevice	BusA_ABS	BusA_BCM	BusA_BCM	idRxDevice	BusA_ABS	BusA_ECM	idRxDevice	enable or invalid
Axis	_2F9_BusA	g_3D1_BusA	_3E9_BusA	_3FC_BusA	_4A3_BusA	_4C1_BusA	_4C7_BusA	_4DF_BusA	_4E1_BusA	frame
Curve	idRxDevice	_BusA_ECM	BusA_ECM	idRxDevice	idRxDevice	BusA_ECM	idRxDevice	_CHCM_A	BusA_BCM	enable or invalid
Axis	_4E9_BusA	g_4F1_BusA	_589_BusA	frame						
Curve	BusA_BCM	_BusA_ECM	BusA_ECM	enable or invalid						

Table 65

Axis	0BE_BusA	GACY_BusA	_0C1_BusA	_0C5_BusA	_0C9_BusA	_0F1_BusA	_CA_BusA	_12A_BusA	_185_BusA	frame
Curve	12.000	12.000	12.000	12.000	0.500	12.000	12.000	12.000	12.000	seconds
Axis	_18E_BusA	GACY_BusA	_191_BusA	_1A1_BusA	_1A3_BusA	_1A5_BusA	1AA_BusA	ACY_BusA	1BA_BusA	frame
Curve	0.500	12.000	12.000	12.000	12.000	12.000	0.500	12.000	0.500	seconds
Axis	1CB_BusA	g_1DF_BusA	_1E9_BusA	_1F1_BusA	_1F3_BusA	_1F9_BusA	1FC_BusA	_287_BusA	2D1_BusA	frame
Curve	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	seconds
Axis	_2F9_BusA	g_3D1_BusA	_3E9_BusA	_3FC_BusA	_4A3_BusA	_4C1_BusA	_4C7_BusA	_4DF_BusA	_4E1_BusA	frame
Curve	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	seconds
Axis	_4E9_BusA	g_4F1_BusA	_589_BusA	frame						
Curve	12.000	12.000	0.500	seconds						

Supporting Documents - 3D Tables

3D_Table 1

CeTSKR_Cnt_MaxCPUs	
CePISR_e_NumOfSeqTasks	
KaPISD_b_ProgSeqWatchEnbl	

X-Axis Calibration	CeTSKR_e_CPU				CPU
Y-Axis Calibration	CePISR_e_6p25msSeq	CePISR_e_12p5msSeq	CePISR_e_25msSeq	CePISR_e_LORES_C	loop test type
Table Calibration	1	1	1	0	BOOLEAN

X-Axis Calibration	CeTSKR_e_CPU2				CPU
Y-Axis Calibration	CePISR_e_6p25msSeq	CePISR_e_12p5msSeq	CePISR_e_25msSeq	CePISR_e_LORES_C	loop test type
Table Calibration	0	0	0	0	BOOLEAN

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Interlock Button Diagnostics								
Transmission Range Selector Enable Switch A Circuit High	P17A4	Detects Selector Enable Switch A circuit reading high	Selector Enable Switch Measured Voltage	> High 853 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Type C No MIL
Transmission Range Selector Enable Switch A Circuit Low	P17A3	Detects Selector Enable Switch A circuit reading low	Shift Enable Switch Measured Voltage	< Low 446 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Type C No MIL
Transmission Range Selector Enable Switch A Circuit Performance	P17A5	Detects Selector Enable Switch A circuit reading outside "Released" or "Pressed" values	Selector Enable Switch Measured Voltage	544 < X < 753 counts (1023 Cnts = 5 Volts)	Not Fault Active	P17A4, P17A3	100 Failures out of 120 Samples (SIB is 5 msec loop)	Emissions Neutral Type C No MIL
Transmission Range Selector Enable Switch A/B Correlation	P17A6	Correlation diagnosic compares both switches	Measured Voltage Percent of Selector Enable Switch A and Switch B	Are both VALID, (Pressed: 49%-61% OR Released: 70% - 82%), but disagree.	Interlock switch comparison diagnostics enabling calibration: The controller has been awake for at least:	True 0.05sec	12.5 msec rate 24000 failures out of 24000 samples.	Emissions Neutral, Type C, No MIL

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Transmission Range Selector Enable Switch B Circuit High	P17A8	Detects Selector Enable Switch B circuit reading high	Selector Enable Switch Measured Voltage	> High 853 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Type C No MIL
Transmission Range Selector Enable Switch B Circuit Low	P17A7	Detects Selector Enable Switch B circuit reading low	Selector Enable Switch Measured Voltage	< Low 446 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	Emissions Neutral Type C No MIL
Transmission Range Selector Enable Switch B Circuit Performance	P17A9	Detects Selector Enable Switch B circuit reading outside "Released" or "Pressed" values	Selector Enable Switch Measured Voltage	544 < X < 753 counts (1023 Cnts = 5 Volts)	Not Fault Active	P17A8, P17A7	100 Failures out of 120 Samples (SIB is 5 msec loop)	Emissions Neutral Type C No MIL
Park Button Diagnostics								
Transmission Park Position Sensor/Switch A Circuit High	P07B4	The Park Button Circuit Diagnostic detects a reading High	Park Position Measured Voltage	> High 853 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	DTC Type B, Two Trips
Transmission Park Position Sensor/Switch A Circuit Low	P07B3	The Park Button Circuit Diagnostic detects a reading Low	Park Position Measured Voltage	< Low 446 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	DTC Type B, Two Trips
Transmission Park Position Sensor/Switch A Circuit Performance	P07B5	The Park Button Circuit Diagnostic detects a reading that is outside of the PRESSED and RELEASED zones.	Park Position Measured Voltage	544 < X < 753 counts (1023 Cnts = 5 Volts)	DTC not set	P07B3 OR P07B4	100 Failures out of 120 Samples (SIB is 5 msec loop)	DTC Type B, Two Trips
Transmission Park Position Sensor/Switch B Circuit High	P07BA	The Park Button Circuit Diagnostic detects a reading High	Park Position Measured Voltage	> High 853 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	DTC Type B, Two Trips

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Transmission Park Position Sensor/Switch B Circuit Low	P07B9	The Park Button Circuit Diagnostic detects a reading Low	Park Position Measured Voltage	< Low 446 counts (1023 Cnts = 5 Volts)			16 Failures out of 20 Samples (SIB is 5 msec loop)	DTC Type B, Two Trips
Transmission Park Position Sensor/Switch B Circuit Performance	P07BB	The Park Button Circuit Diagnostic detects a reading that is outside of the PRESSED and RELEASED zones.	Park Position Measured Voltage	544 < X < 753 counts (1023 Cnts = 5 Volts)	DTC not set	P07BA P07B9	100 Failures out of 120 Samples (SIB is 5 msec loop)	DTC Type B, Two Trips
SIB Controller Fault Diagnostics								
Transmission Range Selector Control Module Memory Checksum Error	P17D8	This DTC will be stored if any software or calibration check sum is incorrect. Modeled after GMs DTC P0601	Calculated Checksum	≠ stored checksum for any of the parts (boot, software, application calibration, system calibration)	Ignition OR Accessory	Run or Run/Crank ON	1 failure if it occurs during the first ROM test of the ignition cycle, otherwise 5 failures Frequency: Runs continuously in the background	DTC Type A 1 trip
		Circuit Monitor mismatch occurs	Switch circuit calculated values	≠ switch circuit monitor values	Ignition OR Accessory	Run or Run/Crank ON	Test runs during calculation of switch circuit values	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Transmission Range Selector Control Module Read Only Memory (ROM) Error	P17D9	Reports a failure if the Built in self test for ROM checksum or the ROM Error correcting code (ECC) check fails.	Checksum at power up	≠ checksum at power-down	Ignition OR Accessory	Run or Run/Crank ON	1 failure Frequency: Once at power-up	DTC Type A 1 trip
			ROM ECC	= fault	Ignition OR Accessory	Run or Run/Crank ON	1 failure Frequency: Runs continuously in the background	
Transmission Range Selector Control Module Internal Random Access Memory (RAM) Error	P17DA	Indicates that control module is unable to correctly write and read data to and from RAM. Modeled after GMs DTC P0604	Data read	≠ Data written	Ignition OR Accessory	Run or Run/Crank ON	1 failure if it occurs during the first RAM test of the ignition cycle, otherwise 5 failures Frequency: Runs continuously in the background	DTC Type A 1 trip

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Transmission Range Selector Control Module Processor	P17DB	Indicates the ECU has detected an internal processor fault. This DTC is dependent on the microprocessor and includes self testing not listed. Modeled after GMs DTC P0606			Ignition Accessory	Run or Run/Crank OR ON		DTC Type A 1 trip
		1. Microprocessor ALU Integrity Diagnostic Monitor Algorithm	Calculated key from rolling seed	≠ expected key			1 failure Test runs continuously (20ms loop or less)	
		2. Main Processor Configuration Register Test	Processor register	≠ expected processor register value			1 failure Test runs continuously (20ms loop or less)	
		3: Seed and Key fault (Set by ECM when seeds and keys do not match)					1 failure Test runs continuously (25ms loop or less)	
		4. Stack overflow	Unused stack memory above maximum stack used	≠ initialized special pattern			1 failure Test run by OS on task switches	
		5. Program Counter exception error	Illegal instruction loaded into program counter				1 failure	
		6. Watchdog Fails to reset	If a fault that should cause a reset fails to cause a reset.				1 failure	
Transmission Range Selector Control Module Keep Alive Memory (KAM) Performance	P17DC	Not used in MY18 and 19. The Scan tool may indicate this DTC as "supported". This is a result of a calibration error.						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Power Moding Diagnostics								
Transmission Range Selector Control Module System Voltage Low	P17DD	Sets when the low voltage system voltage is below a threshold	Battery Voltage	<= 10 Volts	Engine Controller Run Crank Terminal Status - CAN Message	= 1 indicating RUN/CRANK	5 seconds in a 6 second window	Type C
Transmission Range Selector Control Module System Voltage Performance	P17DF	Sets when voltage system voltage signal is erratic.	Battery Voltage Measured Delta Over 10 ms	> 3 Volts	Engine Controller Run Crank Terminal Status - CAN Message	= 1 indicating RUN/CRANK	16 failures out of 40 Samples (SIB is 5 msec loop)	Type C
Transmission Range Selector Control Module System Voltage High	P17DE	Sets when the low voltage system voltage is above a threshold	Battery Voltage	> 16 Volts	Engine Controller Run Crank Terminal Status - CAN Message	= 1 indicating RUN/CRANK	5 seconds in a 6 second window	Type C
Transmission Range Selector Control Module Ignition On/Start Switch Circuit Low	P17E0	Detects if the Ignition1 Switch circuit is shorted to low or open	Ignition 1 voltage	<= 6 V	Engine Controller Run Crank Terminal Status - CAN Message	= 1 indicating RUN/CRANK	4.5 sec in 5.5 second window	Type B 2 trips
Transmission Range Selector Control Module Ignition On/Start Switch Circuit High	P17E1	Detects if the Ignition1 Switch circuit is shorted to vehicle supply voltage	Ignition 1 voltage	> 11.7 V	Engine Controller Run Crank Terminal Status - CAN Message	= 0 indicating NOT RUN/CRANK	4.5 sec in 5.5 second window	Type B 2 trips
Transmission Range Selector Control Module Ignition Accessory Circuit Low	P17E2	Detects if the Accessory Position circuit is shorted to low or open	Accessory voltage	<= 6 V	-	-	4.5 sec in 5.5 second window	DTC Type C

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
Communication Diagnostics								
Transmission Range Selection Signal Message Counter Incorrect	P17D7	ARC & PV reported SIB for $1E8 signal from the ECM on Powertrain Sensor CAN Bus	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1 OR The primary signal value does not equal the protection value	Current ARC ≠ Previous ARC +1 Primary Value ≠ Protection Value	Ignition	Run or Run/Crank	1 second	DTC Type B 2 trips
Transmission Range Selector Control Module Lost Communication with Engine Control Module on Powertrain Sensor CAN Bus	U18C6	Detects that CAN serial data communication has been lost with the ECM.	Powertrain Sensor Bus Message $1E2 OR $1E8	Undetected	Ignition 2. Ignition Run/Crank Voltage	Run or Run/Crank 11V<RCVolt<32V	1 second	DTC Type B 2 trips
Transmission Range Selector Control Module Lost Communication with Engine Control Module on Powertrain Expansion CAN Bus	U18C7	Detects that CAN serial data communication has been lost with the ECM.	Powertrain Expansion Bus	Undetected	Ignition 2. Ignition Run/Crank Voltage	Run or Run/Crank 11V<RCVolt<32V	1 second	DTC Type B 2 trips
Transmission Range Selector Control Module Powertrain Expansion CAN Bus Off	U240D	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state	Powertrain Expansion Bus Status	Off	Ignition	Run or Run/Crank	1 second	DTC Type B 2 trips
Transmission Range Selector Control Module Powertrain Sensor CAN Bus Off	U240E	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state	Powertrain Sensor Bus Status	Off	Ignition	Run or Run/Crank	1 second	DTC Type B 2 trips

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Para-meters	Enable Conditions	Time Required	MIL Illumination
LED Diagnostics								
Shifter Interface Board Range Indicator Failed OR Remote PRNDL Display Internal Electronic Failure	B071F	Detects an indicator LED circuit with a latent fault where an indicator LED could light with a single fault	When sequencing transitors Circuit Feedback Current	> 520 uA (worst case)	Ignition	Run or Run/Crank	detected within 50 ms at first key up	DTC Type C

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
Group 1 - Wheel Speed Sensor							
WSS_OPEN_FRONT_LEFT	C0502	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris ASIC sets FL Open Sensor bit = TRUE when High side current < 3.5mA	Polaris ASIC Open Sensor Bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_OPEN_FRONT_RIGHT	C0508	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris ASIC sets FR Open Sensor bit = TRUE when High side current < 3.5mA	Polaris ASIC Open Sensor Bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_OPEN_REAR_LEFT	C050E	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris ASIC sets RL Open Sensor bit = TRUE when High side current < 3.5mA	Polaris ASIC Open Sensor Bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_OPEN_REAR_RIGHT	C0514	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris ASIC sets RR Open Sensor bit = TRUE when High side current < 3.5mA	Polaris ASIC Open Sensor Bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_SHORT_FRONT_LEFT	C0503	This monitor checks if: • HS Shorted to Battery • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX HS OC = TRUE when High side current > 40mA	High side over current bit= True OR High side short to battery bit= True OR Low side over current bit= True OR Low side short to ground bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_SHORT_FRONT_RIGHT	C0509	This monitor checks if: • HS Shorted to Battery • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX HS OC = TRUE when High side current > 40mA	High side over current bit= True OR High side short to battery bit= True OR Low side over current bit= True OR Low side short to ground bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_SHORT_REAR_LEFT	C050F	This monitor checks if: • HS Shorted to Battery • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX HS OC = TRUE when High side current > 40mA	High side over current bit= True OR High side short to battery bit= True OR Low side over current bit= True OR Low side short to ground bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_SHORT_REAR_RIGHT	C0515	This monitor checks if: • HS Shorted to Battery • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX HS OC = TRUE when High side current > 40mA	High side over current bit= True OR High side short to battery bit= True OR Low side over current bit= True OR Low side short to ground bit= True	• Wheel speed sensor supply is enabled	100 ms	Type A. MIL Illumination.
WSS_LS_SHORT_TO_GND_FRONT_LEFT	C0502	This monitor checks if: • LS Shorted to Ground • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Wheel speed sensor supply is enabled • Tested only during power up or after clear DTC.	100 ms	Type A. MIL Illumination.
WSS_LS_SHORT_TO_GND_FRONT_RIGHT	C0508	This monitor checks if: • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Wheel speed sensor supply is enabled • Tested only during power up or after clear DTC.	100 ms	Type A. MIL Illumination.
WSS_LS_SHORT_TO_GND_REAR_LEFT	C050E	This monitor checks if: • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Wheel speed sensor supply is enabled • Tested only during power up or after clear DTC.	100 ms	Type A. MIL Illumination.
WSS_LS_SHORT_TO_GND_REAR_RIGHT	C0514	This monitor checks if: • LS Shorted to Battery • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Polaris Asic sets XX LS SHORT TO GROUND spi bit= TRUE	• Wheel speed sensor supply is enabled • Tested only during power up or after clear DTC.	100 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_MISSING_FRONT_LEFT	C0505	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	Missing Wheel Speed Sensor If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undroven wheel speed is greater than 6km/h, the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during TC, ABS or MOCO then the detection is run and the detection time is increased.	If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undriven wheel speed is greater than 6km/h the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during ABS, only if the wheel is in pressure dump state, then the detection is run and the detection time is increased.	• Wheel speed sensor supply is enabled. • No Ohmic wheel speed sensor failure present. • No Wss Erratic or Wss Dropout fault present • At least one WSS > 6kph • No excessive high or low voltage • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	3-120s depending on number of missing wss and situation	Type A. MIL Illumination.
			The failsafe will not run in case • exactly one axle is moving (other axle is standstill) while the moving axle shows an average velocity of less than 10km/h (to prevent setting Missing Wss faults on a roller bench). • the dynamic failsafe is currently disabled because the system is currently in Diagnostic mode. Counter type: Counter up and the fault counter reset If all sensors show a speed greater than 6 km/h or the vehicle is in standstill (all sensors lower than 1.5 km/h) Fault maturation time for one Wss missing: a. TC active: 60 sec b. ABS or MOCO not active: 3 sec. c. ABS or MOCO active: 15 sec				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			Fault maturation time for two Wss missing: a. ABS or MOCO active: 15 sec b. If ABS or MOCO not active: 1. If undriven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 3 sec. If velocity is less than 50 km/hr then fault maturation is: 10 sec. 2. If driven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 10 sec. If velocity is less than 50 km/hr then fault maturation is: 30 sec. Fault maturation time for three Wss missing: 120 sec				
WSS_MISSING_FRONT_RIGHT	C050B	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	Missing Wheel Speed Sensor If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undroven wheel speed is greater than 6km/h, the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during TC, ABS or MOCO then the detection is run and the detection time is increased.	If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undriven wheel speed is greater than 6km/h the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during ABS, only if the wheel is in pressure dump state, then the detection is run and the detection time is increased.	• Wheel speed sensor supply is enabled. • No Ohmic wheel speed sensor failure present. • No Wss Erratic or Wss Dropout fault present • At least one WSS > 6kph • No excessive high or low voltage • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	3-120s depending on number of missing wss and situation	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			The failsafe will not run in case • exactly one axle is moving (other axle is standstill) while the moving axle shows an average velocity of less than 10km/h (to prevent setting Missing Wss faults on a roller bench). • the dynamic failsafe is currently disabled because the system is currently in Diagnostic mode. Counter type: Counter up and the fault counter reset If all sensors show a speed greater than 6 km/h or the vehicle is in standstill (all sensors lower than 1.5 km/h) Fault maturation time for one Wss missing: a. TC active: 60 sec b. ABS or MOCO not active: 3 sec. c. ABS or MOCO active: 15 sec				
			Fault maturation time for two Wss missing: a. ABS or MOCO active: 15 sec b. If ABS or MOCO not active: 1. If undriven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 3 sec. If velocity is less than 50 km/hr then fault maturation is: 10 sec. 2. If driven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 10 sec. If velocity is less than 50 km/hr then fault maturation is: 30 sec. Fault maturation time for three Wss missing: 120 sec				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_MISSING_REAR_LEFT	C0511	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	Missing Wheel Speed Sensor If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undroven wheel speed is greater than 6km/h, the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during TC, ABS or MOCO then the detection is run and the detection time is increased.	If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undriven wheel speed is greater than 6km/h the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during ABS, only if the wheel is in pressure dump state, then the detection is run and the detection time is increased.	• Wheel speed sensor supply is enabled. • No Ohmic wheel speed sensor failure present. • No Wss Erratic or Wss Dropout fault present • At least one WSS > 6kph • No excessive high or low voltage • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	3-120s depending on number of missing wss and situation	Type A. MIL Illumination.
			The failsafe will not run in case • exactly one axle is moving (other axle is standstill) while the moving axle shows an average velocity of less than 10km/h (to prevent setting Missing Wss faults on a roller bench). • the dynamic failsafe is currently disabled because the system is currently in Diagnostic mode. Counter type: Counter up and the fault counter reset If all sensors show a speed greater than 6 km/h or the vehicle is in standstill (all sensors lower than 1.5 km/h) Fault maturation time for one Wss missing: a. TC active: 60 sec b. ABS or MOCO not active: 3 sec. c. ABS or MOCO active: 15 sec				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			Fault maturation time for two Wss missing: a. ABS or MOCO active: 15 sec b. If ABS or MOCO not active: 1. If undriven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 3 sec. If velocity is less than 50 km/hr then fault maturation is: 10 sec. 2. If driven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 10 sec. If velocity is less than 50 km/hr then fault maturation is: 30 sec. Fault maturation time for three Wss missing: 120 sec				
WSS_MISSING_REAR_RIGHT	C0517	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	Missing Wheel Speed Sensor If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undroven wheel speed is greater than 6km/h, the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during TC, ABS or MOCO then the detection is run and the detection time is increased.	If one sensor shows a speed of less than 1.5 km/h (standstill detection threshold) while the other sensors indicate a speed greater than 6 km/h, then a missing sensor signal fault occurs. The detection is dependant on the speed of the wheels showing a valid signal. If the average speed of moving wheel (6km/h) is greater than 50 km/h and/or any undriven wheel speed is greater than 6km/h the fault detection time is faster. The entire test sequence is bypassed whenever unexpected wheel acceleration is detected to induce ABS (DRP) activation. The purpose of this handling is to avoid erroneous fault detection. Special case is during ABS, only if the wheel is in pressure dump state, then the detection is run and the detection time is increased.	• Wheel speed sensor supply is enabled. • No Ohmic wheel speed sensor failure present. • No Wss Erratic or Wss Dropout fault present • At least one WSS > 6kph • No excessive high or low voltage • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	3-120s depending on number of missing wss and situation	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			The failsafe will not run in case • exactly one axle is moving (other axle is standstill) while the moving axle shows an average velocity of less than 10km/h (to prevent setting Missing Wss faults on a roller bench). • the dynamic failsafe is currently disabled because the system is currently in Diagnostic mode. Counter type: Counter up and the fault counter reset If all sensors show a speed greater than 6 km/h or the vehicle is in standstill (all sensors lower than 1.5 km/h) Fault maturation time for one Wss missing: a. TC active: 60 sec b. ABS or MOCO not active: 3 sec. c. ABS or MOCO active: 15 sec				
			Fault maturation time for two Wss missing: a. ABS or MOCO active: 15 sec b. If ABS or MOCO not active: 1. If undriven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 3 sec. If velocity is less than 50 km/hr then fault maturation is: 10 sec. 2. If driven wheel is moving then: Fault maturation if velocity greater than 50 km/hr: 10 sec. If velocity is less than 50 km/hr then fault maturation is: 30 sec. Fault maturation time for three Wss missing: 120 sec				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_ERRATIC_FRONT_LEFT	C0504	This monitor checks if: • Wheel speed sensor not mounted correctly. • Missing tooth or teeth on the wheel speed sensor tone-ring. • Electro-magnetic interference (EMI).	• Erratic Wheel Speed Sensor • If the absolute value of the unfiltered wheel acceleration is greater than 491 m/s/s, an erratic wheel speed sensor may be present. The fault occurrence counter will be incremented by 1.4s. If the fault occurrence counter reaches 40 s, then an erratic wheel speed sensor fault is set. • If the wheel acceleration is less than or equal to the above threshold, then the fault occurrence counter is decremented by monitor rate. This allows the system to slowly decay the fault occurrence counter so that only a very erratic wheel speed sensor with unrealistic acceleration values will set this fault.	$\lvert Wheel\_Accel \rvert > 491$ m/s²	• reference_vehicle_velocity > 3.58 m/s • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 s	Type A. MIL Illumination.
			• If the vehicle velocity is below 3.58m/s, the failsafe will detect the fault if excessive acceleration takes place (even in standstill condition). For next ignition cycle, the failsafe won't pass the test completely until the vehicle speed is above the threshold to prevent passing a fault from the previous ignition cycle if the failure only occurs during driving conditions. • Counter: Count 1-up • Monitor Rate: 7ms				
WSS_ERRATIC_FRONT_RIGHT	C050A	This monitor checks if: • Wheel speed sensor not mounted correctly. • Missing tooth or teeth on the wheel speed sensor tone-ring. • Electro-magnetic interference (EMI).	• Erratic Wheel Speed Sensor • If the absolute value of the unfiltered wheel acceleration is greater than 491 m/s/s, an erratic wheel speed sensor may be present. The fault occurrence counter will be incremented by 1.4s. If the fault occurrence counter reaches 40 s, then an erratic wheel speed sensor fault is set. • If the wheel acceleration is less than or equal to the above threshold, then the fault occurrence counter is decremented by monitor rate. This allows the system to slowly decay the fault occurrence counter so that only a very erratic wheel speed sensor with unrealistic acceleration values will set this fault.	$\lvert Wheel\_Accel \rvert > 491$ m/s²	• reference_vehicle_velocity > 3.58 m/s • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 s	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			• If the vehicle velocity is below 3.58m/s, the failsafe will detect the fault if excessive acceleration takes place (even in standstill condition). For next ignition cycle, the failsafe won't pass the test completely until the vehicle speed is above the threshold to prevent passing a fault from the previous ignition cycle if the failure only occurs during driving conditions. • Counter: Count 1-up • Monitor Rate: 7ms				
WSS_ERRATIC_REAR_LEFT	C0510	This monitor checks if: • Wheel speed sensor not mounted correctly. • Missing tooth or teeth on the wheel speed sensor tone-ring. • Electro-magnetic interference (EMI).	• Erratic Wheel Speed Sensor • If the absolute value of the unfiltered wheel acceleration is greater than 491 m/s/s, an erratic wheel speed sensor may be present. The fault occurrence counter will be incremented by 1.4s. If the fault occurrence counter reaches 40 s, then an erratic wheel speed sensor fault is set. • If the wheel acceleration is less than or equal to the above threshold, then the fault occurrence counter is decremented by monitor rate. This allows the system to slowly decay the fault occurrence counter so that only a very erratic wheel speed sensor with unrealistic acceleration values will set this fault.	$\|Wheel\_Accel\| > 491$ m/s²	• reference_vehicle_velocity > 3.58 m/s • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 s	Type A. MIL Illumination.
			• If the vehicle velocity is below 3.58m/s, the failsafe will detect the fault if excessive acceleration takes place (even in standstill condition). For next ignition cycle, the failsafe won't pass the test completely until the vehicle speed is above the threshold to prevent passing a fault from the previous ignition cycle if the failure only occurs during driving conditions. • Counter: Count 1-up • Monitor Rate: 7ms				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_ERRATIC_REAR_RIGHT	C0516	This monitor checks if: • Wheel speed sensor not mounted correctly. • Missing tooth or teeth on the wheel speed sensor tone-ring. • Electro-magnetic interference (EMI).	• Erratic Wheel Speed Sensor • If the absolute value of the unfiltered wheel acceleration is greater than 491 m/s/s, an erratic wheel speed sensor may be present. The fault occurrence counter will be incremented by 1.4s. If the fault occurrence counter reaches 40 s, then an erratic wheel speed sensor fault is set. • If the wheel acceleration is less than or equal to the above threshold, then the fault occurrence counter is decremented by monitor rate. This allows the system to slowly decay the fault occurrence counter so that only a very erratic wheel speed sensor with unrealistic acceleration values will set this fault.	|Wheel_Accel| > 491 m/s²	• reference_vehicle_velocity > 3.58 m/s • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 s	Type A. MIL Illumination.
			• If the vehicle velocity is below 3.58m/s, the failsafe will detect the fault if excessive acceleration takes place (even in standstill condition). For next ignition cycle, the failsafe won't pass the test completely until the vehicle speed is above the threshold to prevent passing a fault from the previous ignition cycle if the failure only occurs during driving conditions. • Counter: Count 1-up • Monitor Rate: 7ms				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_DROPOUT_FRONT_LEFT	C0505	This monitor checks if: • Defective wheel speed sensor. • Wheel speed sensor not mounted correctly. • Defective wheel speed sensor wiring harness. • Missing tooth or teeth on the wheel speed sensor tone-ring.	• Wheel Speed Sensor Dropout • When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. • Once the timer decays to zero (or is already zero), the wheel speed sensor dropout monitor checks if any wheel speed sensor edges have been detected. If wheel speed sensor edges have been detected then we check if the wheel velocity is greater than 0.2236 m/s. If it is then we can pass this failsafe. f not we reset the fault monitor	When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. If no wheel speed sensor edges have been detected then we see which axle the wheel is on because there can be different wheel speed thresholds. We also check if the brake pedal is applied. Wheels can decelerate much faster when the brake pedal is applied than when it is not applied so the brake pedal is used to determine the speed	• Wheel speed sensor supply is enabled. • No ohmic wheel speed sensor failure present • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 ms	Type A. MIL Illumination.
			because we can not monitor this fault condition at this time. • If no wheel speed sensor edges have been detected for more than 150ms while the last valid wheel velocity (which was calculated based on real speed edges) was greater than 30km/h a WSS Dropout fault will be detected. Furthermore the filtered vehicle velocity must be greater than 3.58m/s to detect the fault. • Counter: Count 1-up • Monitor Rate: 7ms	threshold at which the sensor dropout monitor can be executed. If the brake pedal is applied, a higher wheel speed threshold is used than when the brake pedal is not applied. If the brake pedal is applied the wheel speed sensor velocity threshold is 9 m/s for wheels on the front axle and 9 m/s for wheels on the back axle. If the brake pedal is not applied then the wheel speed sensor velocity threshold is 5.38 m/s for wheels on the front axle and 5.38 m/s for wheels on the back axle. If the last valid wheel velocity is greater than the wheel speed velocity threshold set above, the difference in time from the last time we checked for this fault is greater than 40 msec, and the filtered vehicle velocity is above 3.58 m/s then a wheel speed sensor dropout			

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
				fault is detected. If any of these conditions are not true then conditions are not correct to do dropout detection so reset the fault monitor.			
WSS_DROPOUT_FRONT_RIGHT	C050B	This monitor checks if: • Defective wheel speed sensor. • Wheel speed sensor not mounted correctly. • Defective wheel speed sensor wiring harness. • Missing tooth or teeth on the wheel speed sensor tone-ring.	• Wheel Speed Sensor Dropout • When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. • Once the timer decays to zero (or is already zero), the wheel speed sensor dropout monitor checks if any wheel speed sensor edges have been detected. If wheel speed sensor edges have been detected then we check if the wheel velocity is greater than 0.2236 m/s. If it is then we can pass this failsafe. If not we reset the fault monitor because we can not monitor this fault condition at	When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. If no wheel speed sensor edges have been detected then we see which axle the wheel is on because there can be different wheel speed thresholds. We also check if the brake pedal is applied. Wheels can decelerate much faster when the brake pedal is applied than when it is not applied so the brake pedal is used to determine the speed threshold at which the	• Wheel speed sensor supply is enabled. • No ohmic wheel speed sensor failure present • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			this time. • If no wheel speed sensor edges have been detected for more than 150ms while the last valid wheel velocity (which was calculated based on real speed edges) was greater than 30km/h a WSS Dropout fault will be detected. Furthermore the filtered vehicle velocity must be greater than 3.58m/s to detect the fault. • Counter: Count 1-up • Monitor Rate: 7ms	sensor dropout monitor can be executed. If the brake pedal is applied, a higher wheel speed threshold is used than when the brake pedal is not applied. If the brake pedal is applied the wheel speed sensor velocity threshold is 9 m/s for wheels on the front axle and 9 m/s for wheels on the back axle. If the brake pedal is not applied then the wheel speed sensor velocity threshold is 5.38 m/s for wheels on the front axle and 5.38 m/s for wheels on the back axle. If the last valid wheel velocity is greater than the wheel speed velocity threshold set above, the difference in time from the last time we checked for this fault is greater than 40 msec, and the filtered vehicle velocity is above 3.58 m/s then a wheel speed sensor dropout fault is detected. If any of these conditions are not true then conditions are not correct to do dropout detection so reset the fault monitor.			
WSS_DROPOUT_REAR_LEFT	C0511	This monitor checks if: • Defective wheel speed sensor. • Wheel speed sensor not mounted correctly. • Defective wheel speed sensor wiring harness. • Missing tooth or teeth on the wheel speed sensor tone-ring.	• Wheel Speed Sensor Dropout • When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. • Once the timer decays to zero (or is already zero), the wheel speed sensor dropout monitor checks if any wheel speed sensor edges have been detected. If wheel speed sensor edges have been detected then we check if the wheel velocity is greater than 0.2236 m/s. If it is then we can pass this failsafe. If not we reset the fault monitor because we	When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. If no wheel speed sensor edges have been detected then we see which axle the wheel is on because there can be different wheel speed thresholds. We also check if the brake pedal is applied. Wheels can decelerate much faster when the brake pedal is applied than when it is not applied so the brake pedal is	• Wheel speed sensor supply is enabled. • No ohmic wheel speed sensor failure present • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
			can not monitor this fault condition at this time. • If no wheel speed sensor edges have been detected for more than 150ms while the last valid wheel velocity (which was calculated based on real speed edges) was greater than 30km/h a WSS Dropout fault will be detected. Furthermore the filtered vehicle velocity must be greater than 3.58m/s to detect the fault. • Counter: Count 1-up • Monitor Rate: 7ms	used to determine the speed threshold at which the sensor dropout monitor can be executed. If the brake pedal is applied, a higher wheel speed threshold is used than when the brake pedal is not applied. If the brake pedal is applied the wheel speed sensor velocity threshold is 9 m/s for wheels on the front axle and 9 m/s for wheels on the back axle. If the brake pedal is not applied then the wheel speed sensor velocity threshold is 5.38 m/s for wheels on the front axle and 5.38 m/s for wheels on the back axle. If the last valid wheel velocity is greater than the wheel speed velocity threshold set above, the difference in time from the last time we checked for this fault is greater than 40 msec, and the filtered vehicle velocity is above 3.58 m/s then a wheel speed sensor dropout fault is detected.			
				If any of these conditions are not true then conditions are not correct to do dropout detection so reset the fault monitor.			

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_DROPOUT_REAR_RIGHT	C0517	This monitor checks if: • Defective wheel speed sensor. • Wheel speed sensor not mounted correctly. • Defective wheel speed sensor wiring harness. • Missing tooth or teeth on the wheel speed sensor tone-ring.	• Wheel Speed Sensor Dropout • When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. • Once the timer decays to zero (or is already zero), the wheel speed sensor dropout monitor checks if any wheel speed sensor edges have been detected. If wheel speed sensor edges have been detected then we check if the wheel velocity is greater than 0.2236 m/s. If it is then we can pass this failsafe. If not we reset the fault monitor because we	When wheel speed sensor acceleration is detected that is above 392 m/s/s, a timer is initialized to hold off wheel speed sensor dropout detection for 1000 msec. Once this sudden acceleration is detected (and the timer is greater than zero), subsequent accelerations/decelerations greater than 294 m/s/s will reset the timer to the greater of the current timer value or 500 msec. This is done to prevent setting a fault during subsequent performance activity. If no wheel speed sensor edges have been detected then we see which axle the wheel is on because there can be different wheel speed thresholds. We also check if the brake pedal is applied. Wheels can decelerate much faster when the brake pedal is applied than when it is not applied so the brake pedal	• Wheel speed sensor supply is enabled. • No ohmic wheel speed sensor failure present • Diagnostic Mode Inactive • Emissions Rolls Test Inactive	40 ms	Type A. MIL Illumination.
			can not monitor this fault condition at this time. • If no wheel speed sensor edges have been detected for more than 150ms while the last valid wheel velocity (which was calculated based on real speed edges) was greater than 30km/h a WSS Dropout fault will be detected. Furthermore the filtered vehicle velocity must be greater than 3.58m/s to detect the fault. • Counter: Count 1-up • Monitor Rate: 7ms	is used to determine the speed threshold at which the sensor dropout monitor can be executed. If the brake pedal is applied, a higher wheel speed threshold is used than when the brake pedal is not applied. If the brake pedal is applied the wheel speed sensor velocity threshold is 9 m/s for wheels on the front axle and 9 m/s for wheels on the back axle. If the brake pedal is not applied then the wheel speed sensor velocity threshold is 5.38 m/s for wheels on the front axle and 5.38 m/s for wheels on the back axle.			

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
				If the last valid wheel velocity is greater than the wheel speed velocity threshold set above, the difference in time from the last time we checked for this fault is greater than 40 msec, and the filtered vehicle velocity is above 3.58 m/s then a wheel speed sensor dropout fault is detected. If any of these conditions are not true then conditions are not correct to do dropout detection so reset the fault monitor.			
WSS_FAST_MISSING_FRONT_LEFT	C0505	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	• Fast Missing Wheel Speed Sensor • This failsafe is only active from • Ignition On until the vehicle reaches • 15km/h for the first time. • During this time the wheel speeds and wheel • speed pulses are monitored	The wheel speed monitor starts at velocities above 4k. If a wheel speed sensor shows a velocity slower than 1.2km/h the wheel speed is considered to be missing and corresponding internal fault counter of the failsafe will be incremented. At the time the vehicle reaches 15km/h, these fault counters and the wheel speed pulse counters are used to decide whether a fault has to be latched or not. The failsafe will only latch a fault if only one wheel speed signal seems to be missing. If more than one wheel speed signal is missing, no fault will be latched by this failsafe because this is not required to be detected until 15km/h.	• Wheel speed sensor supply is enabled. • No other wheel speed sensor failure present • 15 km/h not reached this ignition cycle • Diagnostic Mode Inactive • Emissions Rolls Test Inactive SYSTEM_VOLTAGE_EXCESSIVE_LOW not latched	1 count	Type A. MIL Illumination.
				If a fast missing fault has been detected the failsafe monitors the conditions until either the failure condition disappears for enough time to remove the fault code or the fault can be removed in case it has been confirmed by another wss fault code.			

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_FAST_MISSING_FRONT_RIGHT	C050B	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	• Fast Missing Wheel Speed Sensor • This failsafe is only active from • Ignition On until the vehicle reaches • 15km/h for the first time. • During this time the wheel speeds and wheel • speed pulses are monitored	The wheel speed monitor starts at velocities above 4k. If a wheel speed sensor shows a velocity slower than 1.2km/h the wheel speed is considered to be missing and corresponding internal fault counter of the failsafe will be incremented. At the time the vehicle reaches 15km/h, these fault counters and the wheel speed pulse counters are used to decide whether a fault has to be latched or not. The failsafe will only latch a fault if only one wheel speed signal seems to be missing. If more than one wheel speed signal is missing, no fault will be latched by this failsafe because this is not required to be detected until 15km/h.	• Wheel speed sensor supply is enabled. • No other wheel speed sensor failure present • 15 km/h not reached this ignition cycle • Diagnostic Mode Inactive • Emissions Rolls Test Inactive SYSTEM_VOLTAGE_EXCESSIVE_LOW not latched	1 count	Type A. MIL Illumination.
				If a fast missing fault has been detected the failsafe monitors the conditions until either the failure condition disappears for enough time to remove the fault code or the fault can be removed in case it has been confirmed by another wss fault code.			
WSS_FAST_MISSING_REAR_LEFT	C0511	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring. (should come from FMEA)	• Fast Missing Wheel Speed Sensor • This failsafe is only active from • Ignition On until the vehicle reaches • 15km/h for the first time. • During this time the wheel speeds and wheel • speed pulses are monitored	The wheel speed monitor starts at velocities above 4k. If a wheel speed sensor shows a velocity slower than 1.2km/h the wheel speed is considered to be missing and corresponding internal fault counter of the failsafe will be incremented. At the time the vehicle reaches 15km/h, these fault counters and the wheel speed pulse counters are used to decide whether a fault has to be latched or not. The failsafe will only latch a fault if only one wheel speed signal seems to be missing. If more than one wheel speed signal is missing, no fault will be latched by this failsafe because this is not required to be detected until 15km/h.	• Wheel speed sensor supply is enabled. • No other wheel speed sensor failure present • 15 km/h not reached this ignition cycle • Diagnostic Mode Inactive • Emissions Rolls Test Inactive SYSTEM_VOLTAGE_EXCESSIVE_LOW not latched	1 count	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
				If a fast missing fault has been detected the failsafe monitors the conditions until either the failure condition disappears for enough time to remove the fault code or the fault can be removed in case it has been confirmed by another wss fault code.			
WSS_FAST_MISSING_REAR_RIGHT	C0517	This monitor checks if: • Wheel speed sensor not mounted correctly. • Wheel speed sensor to tone-ring gap out of tolerance. • Demagnetized tone-ring.	• Fast Missing Wheel Speed Sensor • This failsafe is only active from • Ignition On until the vehicle reaches • 15km/h for the first time. • During this time the wheel speeds and wheel • speed pulses are monitored	The wheel speed monitor starts at velocities above 4k. If a wheel speed sensor shows a velocity slower than 1.2km/h the wheel speed is considered to be missing and corresponding internal fault counter of the failsafe will be incremented. At the time the vehicle reaches 15km/h, these fault counters and the wheel speed pulse counters are used to decide whether a fault has to be latched or not. The failsafe will only latch a fault if only one wheel speed signal seems to be missing. If more than one wheel speed signal is missing, no fault will be latched by this failsafe because this is not required to be detected until 15km/h.	• Wheel speed sensor supply is enabled. • No other wheel speed sensor failure present • 15 km/h not reached this ignition cycle • Diagnostic Mode Inactive • Emissions Rolls Test Inactive SYSTEM_VOLTAGE_EXCESSIVE_LOW not latched	1 count	Type A. MIL Illumination.
				If a fast missing fault has been detected the failsafe monitors the conditions until either the failure condition disappears for enough time to remove the fault code or the fault can be removed in case it has been confirmed by another wss fault code.			
WSS_TOO_FAST_SENSOR_FRONT_LEFT	C0505	This monitor checks if: - Wheel speed sensor not mounted correctly. - Wheel speed sensor to tone-ring gap out of tolerance. - Demagnitized tone-ring	If this wheelspeed sensor reaches a speed over 3.73mph (6 km/h) while the other three show a speed of less than 0.93mph (1.5 km/h) the fault is detected.	If fault detection criteria is fulfilled then WSS_TOO_FAST_SENSOR_XX will latch if WSS_MISSING_XX or WSS_FAST_MISSING_XX or WSS_DROPOUT_XX faults are not latched.	• No electrical failure is currently present	40 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_TOO_FAST_SENSOR_FRONT_RIGHT	C050B	This monitor checks if: - Wheel speed sensor not mounted correctly. - Wheel speed sensor to tone-ring gap out of tolerance. - Demagnitized tone-ring	If this wheelspeed sensor reaches a speed over 3.73mph (6 km/h) while the other three show a speed of less than 0.93mph (1.5 km/h) the fault is detected.	If fault detection criteria is fulfilled then WSS_TOO_FAST_SENSOR_XX will latch if WSS_MISSING_XX or WSS_FAST_MISSING_XX or WSS_DROPOUT_XX faults are not latched.	• No electrical failure is currently present	40 msec	Type A. MIL Illumination.
WSS_TOO_FAST_SENSOR_REAR_LEFT	C0511	This monitor checks if: - Wheel speed sensor not mounted correctly. - Wheel speed sensor to tone-ring gap out of tolerance. - Demagnitized tone-ring	If this wheelspeed sensor reaches a speed over 3.73mph (6 km/h) while the other three show a speed of less than 0.93mph (1.5 km/h) the fault is detected.	If fault detection criteria is fulfilled then WSS_TOO_FAST_SENSOR_XX will latch if WSS_MISSING_XX or WSS_FAST_MISSING_XX or WSS_DROPOUT_XX faults are not latched.	• No electrical failure is currently present	40 msec	Type A. MIL Illumination.
WSS_TOO_FAST_SENSOR_REAR_RIGHT	C0517	This monitor checks if: - Wheel speed sensor not mounted correctly. - Wheel speed sensor to tone-ring gap out of tolerance. - Demagnitized tone-ring	If this wheelspeed sensor reaches a speed over 3.73mph (6 km/h) while the other three show a speed of less than 0.93mph (1.5 km/h) the fault is detected.	If fault detection criteria is fulfilled then WSS_TOO_FAST_SENSOR_XX will latch if WSS_MISSING_XX or WSS_FAST_MISSING_XX or WSS_DROPOUT_XX faults are not latched.	• No electrical failure is currently present	40 msec	Type A. MIL Illumination.
WSS_SHADOWZONE_FRONT_LEFT	C0501	This monitor checks if: • High resistance of wiring harness • High side wheel speed sensor supply shorted to battery voltage with a resistance (leakage current)	• Detection is handled by the Polaris ASIC	Polaris ASIC Low Grey Zone Detect bit = True (The low grey zone is 7 to 14mA) or Polaris ASIC High Grey Zone Detect bit = True (The high grey zone is 14 to 28mA)	• No electrical failure is currently present	750 ms	Type A. MIL Illumination.
WSS_SHADOWZONE_FRONT_RIGHT	C0507	This monitor checks if: • High resistance of wiring harness • High side wheel speed sensor supply shorted to battery voltage with a resistance (leakage current)	• Detection is handled by the Polaris ASIC	Polaris ASIC Low Grey Zone Detect bit = True (The low grey zone is 7 to 14mA) or Polaris ASIC High Grey Zone Detect bit = True (The high grey zone is 14 to 28mA)	• No electrical failure is currently present	750 ms	Type A. MIL Illumination.
WSS_SHADOWZONE_REAR_LEFT	C050D	This monitor checks if: • High resistance of wiring harness • High side wheel speed sensor supply shorted to battery voltage with a resistance (leakage current)	• Detection is handled by the Polaris ASIC	Polaris ASIC Low Grey Zone Detect bit = True (The low grey zone is 7 to 14mA) or Polaris ASIC High Grey Zone Detect bit = True (The high grey zone is 14 to 28mA)	• No electrical failure is currently present	750 ms	Type A. MIL Illumination.
WSS_SHADOWZONE_REAR_RIGHT	C0513	This monitor checks if: • High resistance of wiring harness • High side wheel speed sensor supply shorted to battery voltage with a resistance (leakage current)	• Detection is handled by the Polaris ASIC	Polaris ASIC Low Grey Zone Detect bit = True (The low grey zone is 7 to 14mA) or Polaris ASIC High Grey Zone Detect bit = True (The high grey zone is 14 to 28mA)	• No electrical failure is currently present	750 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_HS_OC_FRONT_LEFT	C0503	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC sets any of these bits = TRUE	Polaris ASIC sets HS Over Current = TRUE High Side Over Current (HS current > 40mA)	• Wheel speed sensor supply is enabled. • High Side failsafe is not blocked	100 msec	Type A. MIL Illumination.
WSS_HS_OC_FRONT_RIGHT	C0509	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC sets any of these bits = TRUE	Polaris ASIC sets any of these bits = TRUE High Side Over Current (HS current > 40mA)	• Wheel speed sensor supply is enabled. • High Side failsafe is not blocked	100 msec	Type A. MIL Illumination.
WSS_HS_OC_REAR_LEFT	C050F	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC sets any of these bits = TRUE	Polaris ASIC sets any of these bits = TRUE High Side Over Current (HS current > 40mA)	• Wheel speed sensor supply is enabled. • High Side failsafe is not blocked	100 msec	Type A. MIL Illumination.
WSS_HS_OC_REAR_RIGHT	C0515	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC sets any of these bits = TRUE	Polaris ASIC sets any of these bits = TRUE High Side Over Current (HS current > 40mA)	• Wheel speed sensor supply is enabled. • High Side failsafe is not blocked	100 msec	Type A. MIL Illumination.
WSS_UNDER_VOLTAGE_FRONT_LEFT	C0502	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Detection is handled by the Polaris ASIC	Polaris ASIC sets WSS Undervoltage disable bit = TRUE	• Wheel speed sensor supply is enabled	20 msec	Type A. MIL Illumination.
WSS_UNDER_VOLTAGE_FRONT_RIGHT	C0508	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Detection is handled by the Polaris ASIC	Polaris ASIC sets WSS Undervoltage disable bit = TRUE	• Wheel speed sensor supply is enabled	20 msec	Type A. MIL Illumination.
WSS_UNDER_VOLTAGE_REAR_LEFT	C050E	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Detection is handled by the Polaris ASIC	Polaris ASIC sets WSS Undervoltage disable bit = TRUE	• Wheel speed sensor supply is enabled	20 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_UNDER_VOLTAGE_REAR_RIGHT	C0514	This monitor checks if: • Defective wheel speed sensor • Defective wire harness to wheel speed sensor • Defective printed circuit board • Defective Polaris ASIC	• Detection is handled by the Polaris ASIC	Polaris ASIC sets WSS Undervoltage disable bit = TRUE	• Wheel speed sensor supply is enabled	20 msec	Type A. MIL Illumination.
ASIC_DECODE_THREE_LEVEL_FAULT_LF	C0555	This monitor checks if: • wrong vehicle config file used • misbuild using wrong WSS	Look for ASIC decoding a three level sensor when a two level sensor is configured: Check for the number of VDA bits received indicates that the ASIC is decoding for a three level sensor or Check for the tp out of range bit received indicates that the ASIC is decoding for a three level sensor	While a wheelspeed channel is expected to be configured for a 2-level sensor (i.e. decode modes 1 or 2), the MCU shall monitor the tp Out of Range and VDA Bit Counter SPI bits. If these bits are not zero, the MCU shall detect that the ASIC is incorrectly decoding in mode 3.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_THREE_LEVEL_DATA_READ_FAULT_LF	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the VDA Data, VDA Bit Counter, Standstill, and tp Out of Range SPI fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set at least every 195ms.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_TWO_LEVEL_DATA_READ_FAULT_LF	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the PWM Pulse Width and Standstill SPI register fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set after every sensor falling edge.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_DECODE_THREE_LEVEL_FAULT_RF	C0556	This monitor checks if: • wrong vehicle config file used • misbuild using wrong WSS	Look for ASIC decoding a three level sensor when a two level sensor is configured: Check for the number of VDA bits received indicates that the ASIC is decoding for a three level sensor or Check for the tp out of range bit received indicates that the ASIC is decoding for a three level sensor	While a wheelspeed channel is expected to be configured for a 2-level sensor (i.e. decode modes 1 or 2), the MCU shall monitor the tp Out of Range and VDA Bit Counter SPI bits. If these bits are not zero, the MCU shall detect that the ASIC is incorrectly decoding in mode 3.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_THREE_LEVEL_DATA_READ_FAULT_RF	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the VDA Data, VDA Bit Counter, Standstill, and tp Out of Range SPI fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set at least every 195ms.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ASIC_TWO_LEVEL_DATA_READ_FAULT_RF	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the PWM Pulse Width and Standstill SPI register fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set after every sensor falling edge.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_DECODE_THREE_LEVEL_FAULT_LR	C0557	This monitor checks if: • wrong vehicle config file used • misbuild using wrong WSS	Look for ASIC decoding a three level sensor when a two level sensor is configured: Check for the number of VDA bits received indicates that the ASIC is decoding for a three level sensor or Check for the tp out of range bit received indicates that the ASIC is decoding for a three level sensor	While a wheelspeed channel is expected to be configured for a 2-level sensor (i.e. decode modes 1 or 2), the MCU shall monitor the tp Out of Range and VDA Bit Counter SPI bits. If these bits are not zero, the MCU shall detect that the ASIC is incorrectly decoding in mode 3.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_THREE_LEVEL_DATA_READ_FAULT_LR	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the VDA Data, VDA Bit Counter, Standstill, and tp Out of Range SPI fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set at least every 195ms.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_TWO_LEVEL_DATA_READ_FAULT_LR	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the PWM Pulse Width and Standstill SPI register fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set after every sensor falling edge.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_DECODE_THREE_LEVEL_FAULT_RR	C0558	This monitor checks if: • wrong vehicle config file used • misbuild using wrong WSS	Look for ASIC decoding a three level sensor when a two level sensor is configured: Check for the number of VDA bits received indicates that the ASIC is decoding for a three level sensor or Check for the tp out of range bit received indicates that the ASIC is decoding for a three level sensor	While a wheelspeed channel is expected to be configured for a 2-level sensor (i.e. decode modes 1 or 2), the MCU shall monitor the tp Out of Range and VDA Bit Counter SPI bits. If these bits are not zero, the MCU shall detect that the ASIC is incorrectly decoding in mode 3.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
ASIC_THREE_LEVEL_DATA_READ_FAULT_RR	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the VDA Data, VDA Bit Counter, Standstill, and tp Out of Range SPI fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set at least every 195ms.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ASIC_TWO_LEVEL_DATA_READ_FAULT_RR	P0606	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	• When the ASIC updates the PWM Pulse Width and Standstill SPI register fields, the ASIC shall also set the Data Read SPI flag.	The MCU shall monitor each wheel's Data Read SPI flag, and verify that the bit is set after every sensor falling edge.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
WSS_3L_INFO_MISSING_FRONT_LEFT	C0555	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long.	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long. Furthermore it checks the number of received data bits in the transmission. If less than the minimum number of data bits (3) are received, a fault will be latched.	• Polaris is initialized. • Wheel Speed Sensor supply is enabled • No WSS electrical fault is present • SYSTEM_VOLTAGE_EXCESSIVE_LOW fault is not present	250 msec	Type A. MIL Illumination.
WSS_3L_INFO_MISSING_FRONT_RIGHT	C0556	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long.	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long. Furthermore it checks the number of received data bits in the transmission. If less than the minimum number of data bits (3) are received, a fault will be latched.	• Polaris is initialized. • Wheel Speed Sensor supply is enabled • No WSS electrical fault is present • SYSTEM_VOLTAGE_EXCESSIVE_LOW fault is not present	250 msec	Type A. MIL Illumination.
WSS_3L_INFO_MISSING_REAR_LEFT	C0557	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long.	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long. Furthermore it checks the number of received data bits in the transmission. If less than the minimum number of data bits (3) are received, a fault will be latched.	• Polaris is initialized. • Wheel Speed Sensor supply is enabled • No WSS electrical fault is present • SYSTEM_VOLTAGE_EXCESSIVE_LOW fault is not present	250 msec	Type A. MIL Illumination.
WSS_3L_INFO_MISSING_REAR_RIGHT	C0558	This monitor checks if: • Defective system ASIC ASIC data read flag is not updated properly	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long.	Monitors if an intelligent 3-level wss doesn't send pulses (standstill or wheel speed pulses) for too long. Furthermore it checks the number of received data bits in the transmission. If less than the minimum number of data bits (3) are received, a fault will be latched.	• Polaris is initialized. • Wheel Speed Sensor supply is enabled • No WSS electrical fault is present • SYSTEM_VOLTAGE_EXCESSIVE_LOW fault is not present	250 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_PARITY_FRONT_LEFT	C0555	This monitor checks if: VDA data bits are corrupted	Decodes the additional information of a Philips KMI22/1 wheelspeed sensor which is a 3-level VDA compliant sensor.	It's a VDA compliant Philips KMI22/1 sensor so use the following mask for the data bits: 0 air gap (1=too large) 1 mode state (1=initial mode, 0=active mode) 2 digital input state (1=input voltage low) 3 validity direction recognition (1=direction bit is valid) 4 direction recognition (1=direction positive (forward driving)) 5-7 sensing distance bits (air gap) (Bit 5 is LSB, 7 MSB) (8) parity (1=even parity)	• Polaris is initialized. • Wheel Speed Sensor supply is enabled	35 msec	Type A. MIL Illumination.
				The even parity flag should be the same as the calculated even parity. Else, it indicates that atleast one data bit is corrupted.			
WSS_PARITY_FRONT_RIGHT	C0556	This monitor checks if: VDA data bits are corrupted	Decodes the additional information of a Philips KMI22/1 wheelspeed sensor which is a 3-level VDA compliant sensor.	It's a VDA compliant Philips KMI22/1 sensor so use the following mask for the data bits: 0 air gap (1=too large) 1 mode state (1=initial mode, 0=active mode) 2 digital input state (1=input voltage low) 3 validity direction recognition (1=direction bit is valid) 4 direction recognition (1=direction positive (forward driving)) 5-7 sensing distance bits (air gap) (Bit 5 is LSB, 7 MSB) (8) parity (1=even parity)	• Polaris is initialized. • Wheel Speed Sensor supply is enabled	35 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
				The even parity flag should be the same as the calculated even parity. Else, it indicates that atleast one data bit is corrupted.			
WSS_PARITY_REAR_LEFT	C0557	This monitor checks if: VDA data bits are corrupted	Decodes the additional information of a Philips KMI22/1 wheelspeed sensor which is a 3-level VDA compliant sensor.	It's a VDA compliant Philips KMI22/1 sensor so use the following mask for the data bits: 0 air gap (1=too large) 1 mode state (1=initial mode, 0=active mode) 2 digital input state (1=input voltage low) 3 validity direction recognition (1=direction bit is valid) 4 direction recognition (1=direction positive (forward driving)) 5-7 sensing distance bits (air gap) (Bit 5 is LSB, 7 MSB) (8) parity (1=even parity)	• Polaris is initialized. • Wheel Speed Sensor supply is enabled	35 msec	Type A. MIL Illumination.
				The even parity flag should be the same as the calculated even parity. Else, it indicates that atleast one data bit is corrupted.			

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_PARITY_REAR_RIGHT	C0558	This monitor checks if: VDA data bits are corrupted	Decodes the additional information of a Philips KMI22/1 wheelspeed sensor which is a 3-level VDA compliant sensor.	It's a VDA compliant Philips KMI22/1 sensor so use the following mask for the data bits: 0 air gap (1=too large) 1 mode state (1=initial mode, 0=active mode) 2 digital input state (1=input voltage low) 3 validity direction recognition (1=direction bit is valid) 4 direction recognition (1=direction positive (forward driving)) 5-7 sensing distance bits (air gap) (Bit 5 is LSB, 7 MSB) (8) parity (1=even parity)	• Polaris is initialized. • Wheel Speed Sensor supply is enabled	35 msec	Type A. MIL Illumination.
				The even parity flag should be the same as the calculated even parity. Else, it indicates that atleast one data bit is corrupted.			
WSS_VDA_TP_OUT_OF_RANGE_FRONT_LEFT	C0501	This monitor checks if: • standstill pulse width out of range • Defective system ASIC	• The ASIC shall measure the width of each speed pulse or speed replacement pulse (tp). If tp is less than tp minimum threshold or greater than tp maximum threshold, the ASIC shall set the tp Out of Range SPI flag.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse width is out of range (error bit equals 1) (3 level WSS only)	• Polaris is initialized	15 msec -375ms	Type A. MIL Illumination.
WSS_VDA_TP_OUT_OF_RANGE_FRONT_RIGHT	C0507	This monitor checks if: • standstill pulse width out of range • Defective system ASIC	• The ASIC shall measure the width of each speed pulse or speed replacement pulse (tp). If tp is less than tp minimum threshold or greater than tp maximum threshold, the ASIC shall set the tp Out of Range SPI flag.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse width is out of range (error bit equals 1) (3 level WSS only)	• Polaris is initialized	15 msec -375ms	Type A. MIL Illumination.
WSS_VDA_TP_OUT_OF_RANGE_REAR_LEFT	C050D	This monitor checks if: • standstill pulse width out of range • Defective system ASIC	• The ASIC shall measure the width of each speed pulse or speed replacement pulse (tp). If tp is less than tp minimum threshold or greater than tp maximum threshold, the ASIC shall set the tp Out of Range SPI flag.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse width is out of range (error bit equals 1) (3 level WSS only)	• Polaris is initialized	15 msec -375ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_VDA_TP_OUT_OF_RANGE_REAR_RIGHT	C0513	This monitor checks if: • standstill pulse width out of range • Defective system ASIC	• The ASIC shall measure the width of each speed pulse or speed replacement pulse (tp). If tp is less than tp minimum threshold or greater than tp maximum threshold, the ASIC shall set the tp Out of Range SPI flag.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse width is out of range (error bit equals 1) (3 level WSS only)	• Polaris is initialized	15 msec -375ms	Type A. MIL Illumination.
WSS_STANDSTILL_FAST_FRONT_LEFT	C0501	This monitor checks if: • Defective system ASIC Standstill VDA transmission too short	• The MCU shall detect if standstill pulses occur faster than every 95ms, for 5 consecutive standstill pulses.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too short - less than 105 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and detection rules. Range is from 25 - 475ms.	Type A. MIL Illumination.
WSS_STANDSTILL_SLOW_FRONT_LEFT	C0501	This monitor checks if: • Defective system ASIC • Standstill VDA transmission too long	• The MCU shall detect if standstill pulses occur slower than every 205ms, or no standstill pulse at all for 1025ms.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too long - more than 195 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and Detection Rules. Range is from 1025 - 5100ms.	Type A. MIL Illumination.
WSS_STANDSTILL_FAST_FRONT_RIGHT	C0507	This monitor checks if: • Defective system ASIC Standstill VDA transmission too short	• The MCU shall detect if standstill pulses occur faster than every 95ms, for 5 consecutive standstill pulses.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too short - less than 105 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and detection rules. Range is from 25 - 475ms.	Type A. MIL Illumination.
WSS_STANDSTILL_SLOW_FRONT_RIGHT	C0507	This monitor checks if: • Defective system ASIC • Standstill VDA transmission too long	• The MCU shall detect if standstill pulses occur slower than every 205ms, or no standstill pulse at all for 1025ms.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too long - more than 195 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and Detection Rules. Range is from 1025 - 5100ms.	Type A. MIL Illumination.
WSS_STANDSTILL_FAST_REAR_LEFT	C050D	This monitor checks if: • Defective system ASIC Standstill VDA transmission too short	• The MCU shall detect if standstill pulses occur faster than every 95ms, for 5 consecutive standstill pulses.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too short - less than 105 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and detection rules. Range is from 25 - 475ms.	Type A. MIL Illumination.
WSS_STANDSTILL_SLOW_REAR_LEFT	C050D	This monitor checks if: • Defective system ASIC • Standstill VDA transmission too long	• The MCU shall detect if standstill pulses occur slower than every 205ms, or no standstill pulse at all for 1025ms.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too long - more than 195 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and Detection Rules. Range is from 1025 - 5100ms.	Type A. MIL Illumination.
WSS_STANDSTILL_FAST_REAR_RIGHT	C0513	This monitor checks if: • Defective system ASIC Standstill VDA transmission too short	• The MCU shall detect if standstill pulses occur faster than every 95ms, for 5 consecutive standstill pulses.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too short - less than 105 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and detection rules. Range is from 25 - 475ms.	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_STANDSTILL_SLOW_REAR_RIGHT	C0513	This monitor checks if: • Defective system ASIC • Standstill VDA transmission too long	• The MCU shall detect if standstill pulses occur slower than every 205ms, or no standstill pulse at all for 1025ms.	POLARIS ASIC sends diagnostic information indicating that the standstill pulse transmission is too long - more than 195 msec (3 level WSS only)	• Polaris is initialized	Variable. See Fault Equation and Detection Rules. Range is from 1025 - 5100ms.	Type A. MIL Illumination.
SYS_ASIC_WSS_EDGE_MISMATCH_LF	P0606	This monitor checks if: • ASIC outputs shorted to neighbouring pins • Open trace on circuit board. • Defective system ASIC	The Wheel Speed signal generated by the ASIC and the one received by the main Micro should match to insure correct wheel speed calculation.	1) The micro monitors the number of edges received every loop for plausability (less than a max number). 2) The micro will compare the edges detected by the internal timer with the SPI flags sent by the ASIC to make sure they match.	• Polaris is initialized • No other ASIC faults detected	25 msec	Type A. MIL Illumination.
SYS_ASIC_WSS_EDGE_MISMATCH_RF	P0606	This monitor checks if: • ASIC outputs shorted to neighbouring pins • Open trace on circuit board. • Defective system ASIC	The Wheel Speed signal generated by the ASIC and the one received by the main Micro should match to insure correct wheel speed calculation.	1) The micro monitors the number of edges received every loop for plausability (less than a max number). 2) The micro will compare the edges detected by the internal timer with the SPI flags sent by the ASIC to make sure they match.	• Polaris is initialized • No other ASIC faults detected	25 msec	Type A. MIL Illumination.
SYS_ASIC_WSS_EDGE_MISMATCH_LR	P0606	This monitor checks if: • ASIC outputs shorted to neighbouring pins • Open trace on circuit board. • Defective system ASIC	The Wheel Speed signal generated by the ASIC and the one received by the main Micro should match to insure correct wheel speed calculation.	1) The micro monitors the number of edges received every loop for plausability (less than a max number). 2) The micro will compare the edges detected by the internal timer with the SPI flags sent by the ASIC to make sure they match.	• Polaris is initialized • No other ASIC faults detected	25 msec	Type A. MIL Illumination.
SYS_ASIC_WSS_EDGE_MISMATCH_RR	P0606	This monitor checks if: • ASIC outputs shorted to neighbouring pins • Open trace on circuit board. • Defective system ASIC	The Wheel Speed signal generated by the ASIC and the one received by the main Micro should match to insure correct wheel speed calculation.	1) The micro monitors the number of edges received every loop for plausability (less than a max number). 2) The micro will compare the edges detected by the internal timer with the SPI flags sent by the ASIC to make sure they match.	• Polaris is initialized • No other ASIC faults detected	25 msec	Type A. MIL Illumination.
MCU_WSS_EXCESSIVE_EDGES_DETECTED_FRONT_LEFT	C0504	This monitor checks if: • Defective system ASIC • Defective wheel speed sensor	This fault is latched when the edge counts exceeds the threshold.	Excessive Edge counts > 55	• Wheel speed sensor supply is enabled	25 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MCU_WSS_EXCESSIVE_EDGES_DETECTED_FRONT_RIGHT	C050A	This monitor checks if: • Defective system ASIC • Defective wheel speed sensor	This fault is latched when the edge counts exceeds the threshold.	Excessive Edge counts > 55	• Wheel speed sensor supply is enabled	25 msec	Type A. MIL Illumination.
MCU_WSS_EXCESSIVE_EDGES_DETECTED_REAR_LEFT	C0510	This monitor checks if: • Defective system ASIC • Defective wheel speed sensor	This fault is latched when the edge counts exceeds the threshold.	Excessive Edge counts > 55	• Wheel speed sensor supply is enabled	25 msec	Type A. MIL Illumination.
MCU_WSS_EXCESSIVE_EDGES_DETECTED_REAR_RIGHT	C0516	This monitor checks if: • Defective system ASIC • Defective wheel speed sensor	This fault is latched when the edge counts exceeds the threshold.	Excessive Edge counts > 55	• Wheel speed sensor supply is enabled	25 msec	Type A. MIL Illumination.
WSS_TYPE_MISMATCH_FRONT_LEFT	C0555	This monitor checks if: • Incorrect WSS installed (Non-Directional or Infineon sensor)	• Probability counters are used to determine the likelihood of possible DWSS sensors. Therefore, no speed or time filtering is needed. Detection time depends on wheel speed. When the vehicle is at a stop, detection time is longest since no direction is transmitted (both sensor types look the same) and standstill pulses are used instead. At high-speeds, detection is shortest since missing or extra direction information will indicate the sensor installed.	Algorithm has detected that a directional WSS has incorrectly been installed	• WSS must be valid (supply enabled and no electrical problems)	5 msec	Type A. MIL Illumination.
WSS_TYPE_MISMATCH_FRONT_RIGHT	C0556	This monitor checks if: • Incorrect WSS installed (Non-Directional or Infineon sensor)	• Probability counters are used to determine the likelihood of possible DWSS sensors. Therefore, no speed or time filtering is needed. Detection time depends on wheel speed. When the vehicle is at a stop, detection time is longest since no direction is transmitted (both sensor types look the same) and standstill pulses are used instead. At high-speeds, detection is shortest since missing or extra direction information will indicate the sensor installed.	Algorithm has detected that a directional WSS has incorrectly been installed	• WSS must be valid (supply enabled and no electrical problems)	5 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_TYPE_MISMATCH_REAR_LEFT	C0557	This monitor checks if: • Incorrect WSS installed (Non-Directional or Infineon sensor)	• Probability counters are used to determine the likelihood of possible DWSS sensors. Therefore, no speed or time filtering is needed. Detection time depends on wheel speed. When the vehicle is at a stop, detection time is longest since no direction is transmitted (both sensor types look the same) and standstill pulses are used instead. At high-speeds, detection is shortest since missing or extra direction information will indicate the sensor installed.	Algorithm has detected that a directional WSS has incorrectly been installed	• WSS must be valid (supply enabled and no electrical problems)	5 msec	Type A. MIL Illumination.
WSS_TYPE_MISMATCH_REAR_RIGHT	C0558	This monitor checks if: • Incorrect WSS installed (Non-Directional or Infineon sensor)	• Probability counters are used to determine the likelihood of possible DWSS sensors. Therefore, no speed or time filtering is needed. Detection time depends on wheel speed. When the vehicle is at a stop, detection time is longest since no direction is transmitted (both sensor types look the same) and standstill pulses are used instead. At high-speeds, detection is shortest since missing or extra direction information will indicate the sensor installed.	Algorithm has detected that a directional WSS has incorrectly been installed	• WSS must be valid (supply enabled and no electrical problems)	5 msec	Type A. MIL Illumination.
SYS_ASIC_U_WS_OVER_VOLT	C05A3	This monitor checks if: Defective System ASIC	If VU_WS exceeds the rising U_WS over-voltage detection threshold for the detection debounce time, the ASIC sets the U_WS Overvoltage Warning SPI flag and disable the four high-side switches.	The MCU shall configure the wheelspeed sensor overvoltage bypass configuration to LOW. If the WSS overvoltage warning bit is set, fault is set.	Polaris is initialized	5 msec	Type A. MIL Illumination.
SYS_ASIC_WSS_SUPPLY_LOW	C05A4	This monitor checks if: • Defective system ASIC	• Within the ASIC, the U_WS and U12 voltages shall be internally divided down and shall feed dedicated ADC channels.	The MCU shall read the ASIC's U_WS Voltage Result SPI field and verify that "sufficient voltage" is present for wheelspeed operation. For ECUs with no U_WS voltage regulation: the MCU shall also read the ASIC's U12 Voltage Result SPI field and perform a plausibility check between U_WS and U12. Note: sufficient voltage for wheelspeed operation depends upon the type of wheelspeed sensor used.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WSS_OVER_TEMP_WARNING	P0606	This monitor checks if: • Defective system ASIC • internal overheating	• MCU shall monitor the U_WS OverTemp Warning SPI flag received from the ASIC	MCU detects that the U_WS OverTemp Warning SPI flag received from the ASIC is TRUE	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_WSS_HS_STUCK_ON	C05A3	This monitor checks if: • Defective system ASIC	• The ASIC's open circuit detection (SM42) shall remain operational even if the channel's high-side supply is turned off or disabled. • Periodically (e.g. once per ignition cycle), the MCU shall enable the low-side wheelspeed supplies but shall leave the high-side supplies off. The MCU shall detect if an open-circuit is not detected on any channel. • Periodically (e.g. once per ignition cycle), the MCU shall command the wheelspeed high-side supplies off, low-side supplies on, and verify that each channel's Open Circuit SPI bit is set.	Any one wheel fails to detect an open-circuit during either the high-side or low-side supply ON check.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
MISMATCH_TIRE	C10EE	This monitor checks if: • Significantly different size tires installed on the vehicle. • Missing target ring (sensor picking up lug nuts) • Anything that generates consistent differences in apparent wheel rotational speed. • Different number of teeth on the exciter rings.	• Wheel Velocity Differences between one and the others > 20 %. • The mismatch tire ratio adjustment is disabled if: • Vehicle Velocity < 8.9 mph, • Cornering is detected, • Spinning wheels are detected, • Braking is detected, • Wheel speed sensor faults exist. • Counter: Count 1-up • Monitor Rate: 10ms	Wheel Velocity difference between one and the others > 20 %	• The mismatch tire ratio adjustment is disabled if: • Vehicle Velocity < 8.9 mph, • Cornering is detected, • Spinning wheels are detected, • Braking is detected, • Wheel speed sensor faults exist, • Emissions Rolls Test is active	1 Count	Type A. MIL Illumination.
Group 3 - Solenoid and Valve							
SOL_OPEN_ISO_FRONT_LEFT	C0010	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OPEN_ISO_FRONT_RIGHT	C0014	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On and not faulted 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_ISO_REAR_LEFT	C0018	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_ISO_REAR_RIGHT	C001C	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OPEN_DUMP_FRONT_LEFT	C0011	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_DUMP_FRONT_RIGHT	C0015	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_DUMP_REAR_LEFT	C0019	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_DUMP_REAR_RIGHT	C001D	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OPEN_3WAY_PRIMARY	C0001	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_3WAY_SECONDARY	C0003	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_FDBK_UNEQUAL_TO_CMD_3WAY_PRIMARY	C0001	This monitor checks if: • Deviation in PWM output status • Defective microprocessor. • Defective printed circuit board. • Defective solenoid. • Defective solenoid driver FET.	Whenever the power switch is closed and the driver FET is not turned on (solenoid commanded off) then the feedback voltage should be high. If the solenoid feedback voltage is measured to be > 43.49% and < 65.23% of the coil supply voltage for 30 msec, an open solenoid fault is indicated	For too short on time = Ontime - 7.5% period For too long on time = Ontime + 7.5% period	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	60 ms	Type A. MIL Illumination.
SOL_FDBK_UNEQUAL_TO_CMD_3WAY_SECONDARY	C0003	This monitor checks if: • Deviation in PWM output status • Defective microprocessor. • Defective printed circuit board. • Defective solenoid. • Defective solenoid driver FET.	Whenever the power switch is closed and the driver FET is not turned on (solenoid commanded off) then the feedback voltage should be high. If the solenoid feedback voltage is measured to be > 43.49% and < 65.23% of the coil supply voltage for 30 msec, an open solenoid fault is indicated.	For too short on time = Ontime - 7.5% period For too long on time = Ontime + 7.5% period	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OPEN_NORMAL_ CLOSE_DAP	C0004	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_PEDAL_SI M_ISO	C0024	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_NORMAL_ OPEN_DAP	C0002	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_OPEN_SIM_TEST	C05D5	This monitor checks if: • Defective solenoid. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Leaky FET Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	After the driver is commanded on, the ASIC shall wait the open driver mask time, and then observe the filtered drain comparator feedback. If the drain feedback is high, the ASIC shall set the DRDx Open Driver Warning SPI bit. Drain comparator threshold: min value = 2.375 V max value = 2.625 V	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
DRIVER_SHORT_ISO_FRONT_LEFT	C0010	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_ISO_FRONT_RIGHT	C0014	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_ISO_REAR_LEFT	C0018	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_ISO_REAR_RIGHT	C001C	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_DUMP_FRONT_LEFT	C0011	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
DRIVER_SHORT_DUMP _FRONT_RIGHT	C0015	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_DUMP _REAR_LEFT	C0019	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_DUMP _REAR_RIGHT	C001D	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver • Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_3WAY _PRIMARY	C0001	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_3WAY _SECONDARY	C0003	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
DRIVER_SHORT_NORMAL_CLOSE_DAP	C0004	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_PEDAL_SIM_ISO	C0024	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_NORMAL_OPEN_DAP	C0002	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
DRIVER_SHORT_SIM_TEST	C05D5	This monitor checks if: • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• Shorted Solenoid Driver Vehicle battery voltage is applied to the high side of the solenoid coils in the ECU assembly by the power switch. The solenoids are energized using a field effect transistor (FET) to connect the low side of the coil to ground.	Solenoid_feedback ? 43%	1. Solenoid is commanded off for 20 msec 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	30 ms	Type A. MIL Illumination.
SOL_SHORT_ISO_FRONT_LEFT	C0010	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_SHORT_ISO_FRONT_RIGHT	C0014	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_ISO_REAR_LEFT	C0018	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_ISO_REAR_RIGHT	C001C	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_SHORT_DUMP_FRONT_LEFT	C0011	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_DUMP_FRONT_RIGHT	C0015	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_DUMP_REAR_LEFT	C0019	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_SHORT_DUMP_REAR_RIGHT	C001D	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage high when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. • The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_3WAY_PRIMARY	C0001	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_3WAY_SECONDARY	C0003	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_SHORT_NORMAL_CLOSE_DAP	C0004	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_PEDAL_SIM_ISO	C0024	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_NORMAL_OPEN_DAP	C0002	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.
SOL_SHORT_SIM_TEST	C05D5	This monitor checks if: • Solenoid coils shorted internally. • Solenoid shorted to a voltage supply or ground. • Defective solenoid driver FET. • Defective printed circuit board. • Defective microprocessor. • Anything that keeps solenoid feedback voltage low when the solenoid is not energized.	• The ASIC shall detect an open driver condition or a shorted coil condition on the external driver FETs by monitoring the drain voltage while the driver is commanded on. The ASIC shall generate a filtered drain comparator feedback signal by comparing the DRDx pin voltage to the drain comparator threshold, and by then filtering the result for the drain comparator feedback debounce time.	The MCU can make the distinction between open driver and shorted coil by performing a coil test pulse on the faulted channel with all other coil channels off. Drain comparator threshold: • min value = 2.375 V • max value = 2.625 V	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	15 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OVERTEMP_ISO_ FRONT_LEFT	C0010	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_ISO_ FRONT_RIGHT	C0014	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_ISO_ REAR_LEFT	C0018	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_ISO_ REAR_RIGHT	C001C	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_DUM P_FRONT_LEFT	C0011	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OVERTEMP_DUMP_FRONT_RIGHT	C0015	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_DUMP_REAR_LEFT	C0019	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_DUMP_REAR_RIGHT	C001D	This monitor checks if: • Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_OVERTEMP_3WAY_PRIMARY	C0001	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type A. MIL Illumination.
SOL_OVERTEMP_3WAY_SECONDARY	C0003	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_OVERTEMP_NORMAL_CLOSE_DAP	C0004	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type A. MIL Illumination.
SOL_OVERTEMP_PEDAL_SIM_ISO	C0024	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type A. MIL Illumination.
SOL_OVERTEMP_NORMAL_OPEN_DAP	C0002	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type A. MIL Illumination.
SOL_OVERTEMP_SIM_TEST	C05D5	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Solenoid Over Temperature • At power up the solenoids are set to the maximum of the ambient temperature as reported by the Polaris ASIC or the solenoid temperature reading stored in NVRAM from the last ignition cycle.	Solenoid_Temperature > 265 °C	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	1 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SOL_DRIVER_OVERTEMP_ISO_FRONT_LEFT	C0010	This monitor checks if: • Anything that causes the solenoid driver to be active for excessive (usually unintended) period of time	• Driver Overtemp info transmitted via SPI from Polaris ASIC	Polaris ASIC sends diagnostic information that the driver used to control the coil has exceeded the maximum alloted temperature. Microprocessor recieves the information via SPI from the ASIC	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	5 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_DRIVER_OVERTEMP_ISO_FRONT_RIGHT	C0014	This monitor checks if: • Anything that causes the solenoid driver to be active for excessive (usually unintended) period of time	• Driver Overtemp info transmitted via SPI from Polaris ASIC	Polaris ASIC sends diagnostic information that the driver used to control the coil has exceeded the maximum alloted temperature. Microprocessor recieves the information via SPI from the ASIC	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	5 msec	Type A. MIL Illumination.
SOL_DRIVER_OVERTEMP_ISO_REAR_LEFT	C0018	This monitor checks if: • Anything that causes the solenoid driver to be active for excessive (usually unintended) period of time	• Driver Overtemp info transmitted via SPI from Polaris ASIC	Polaris ASIC sends diagnostic information that the driver used to control the coil has exceeded the maximum alloted temperature. Microprocessor recieves the information via SPI from the ASIC	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	5 msec	Type A. MIL Illumination.
SOL_DRIVER_OVERTEMP_ISO_REAR_RIGHT	C001C	This monitor checks if: • Anything that causes the solenoid driver to be active for excessive (usually unintended) period of time	• Driver Overtemp info transmitted via SPI from Polaris ASIC	Polaris ASIC sends diagnostic information that the driver used to control the coil has exceeded the maximum alloted temperature. Microprocessor recieves the information via SPI from the ASIC	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	5 msec	Type A. MIL Illumination.
SOL_DRIVER_OVERTEMP_PEDAL_SIM_ISO	C0024	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Driver Overtemp info transmitted via SPI from Polaris ASIC	Polaris ASIC sends diagnostic information that the driver used to control the coil has exceeded the maximum alloted temperature. Microprocessor recieves the information via SPI from the ASIC	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	5 msec	Type A. MIL Illumination.
SOL_DRIVER_OVERTEMP_NORMAL_OPEN_DAP	C0002	This monitor checks if: Anything that causes the solenoid to be active for excessive (usually unintended) period of time	• Driver Overtemp info transmitted via SPI from Polaris ASIC	Polaris ASIC sends diagnostic information that the driver used to control the coil has exceeded the maximum alloted temperature. Microprocessor recieves the information via SPI from the ASIC	1. Solenoid is commanded On 2. Power Switch is On 3. {EXCESSIVE_LOW_SYSTEM_VOLTAGE} 7.5 V < Supply Voltage < 18 V {EXCESSIVE_HIGH_SYSTEM_VOLTAGE}	5 msec	Type A. MIL Illumination.
CLAMP_ACTIVATION_FAILURE_ISO_FRONT_LEFT	C0010	This monitor checks if: • Defective / Missing Flyback Diode • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC monitors the solenoid back EMF. If it is above +40V then the Polaris triggers a Clamping Response. If this occurs on two consecutive shut-offs then the Clamp Activation bit is set and the coil output is shut off. Microprocessor receives the information via SPI from the ASIC	Microprocessor receives the information via SPI from the ASIC every 5 msec. If the Clamp Activation bit is set then the bit and coil output are reset to allow another test run until the Clamp Activation Fault has matured.	1. Coil Overcurrent DTC is not set 2. No CLAMP_ACTIVATION_FAILURE DTC is set 3. execute as part of Power-Up System Test, Periodic Coil Test or anytime ABS Iso is activated during performance	45 counts (minimum 3 failures in 10 attempts)	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
CLAMP_ACTIVATION_FAILURE_ISO_FRONT_RIGHT	C0014	This monitor checks if: • Defective / Missing Flyback Diode • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC monitors the solenoid back EMF. If it is above +40V then the Polaris triggers a Clamping Response. If this occurs on two consecutive shut-offs then the Clamp Activation bit is set and the coil output is shut off. Microprocessor receives the information via SPI from the ASIC	Microprocessor receives the information via SPI from the ASIC every 5 msec. If the Clamp Activation bit is set then the bit and coil output are reset to allow another test run until the Clamp Activation Fault has matured.	1. Coil Overcurrent DTC is not set 2. No CLAMP_ACTIVATION_FAILURE DTC is set 3. execute as part of Power-Up System Test, Periodic Coil Test or anytime ABS Iso is activated during performance	45 counts (minimum 3 failures in 10 attempts)	Type A. MIL Illumination.
CLAMP_ACTIVATION_FAILURE_ISO_REAR_LEFT	C0018	This monitor checks if: • Defective / Missing Flyback Diode • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC monitors the solenoid back EMF. If it is above +40V then the Polaris triggers a Clamping Response. If this occurs on two consecutive shut-offs then the Clamp Activation bit is set and the coil output is shut off. Microprocessor receives the information via SPI from the ASIC	Microprocessor receives the information via SPI from the ASIC every 5 msec. If the Clamp Activation bit is set then the bit and coil output are reset to allow another test run until the Clamp Activation Fault has matured.	1. Coil Overcurrent DTC is not set 2. No CLAMP_ACTIVATION_FAILURE DTC is set 3. execute as part of Power-Up System Test, Periodic Coil Test or anytime ABS Iso is activated during performance	45 counts (minimum 3 failures in 10 attempts)	Type A. MIL Illumination.
CLAMP_ACTIVATION_FAILURE_ISO_REAR_RIGHT	C001C	This monitor checks if: • Defective / Missing Flyback Diode • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC monitors the solenoid back EMF. If it is above +40V then the Polaris triggers a Clamping Response. If this occurs on two consecutive shut-offs then the Clamp Activation bit is set and the coil output is shut off. Microprocessor receives the information via SPI from the ASIC	Microprocessor receives the information via SPI from the ASIC every 5 msec. If the Clamp Activation bit is set then the bit and coil output are reset to allow another test run until the Clamp Activation Fault has matured.	1. Coil Overcurrent DTC is not set 2. No CLAMP_ACTIVATION_FAILURE DTC is set 3. execute as part of Power-Up System Test, Periodic Coil Test or anytime ABS Iso is activated during performance	45 counts (minimum 3 failures in 10 attempts)	Type A. MIL Illumination.
CLAMP_ACTIVATION_FAILURE_NORMAL_OPEN_DAP	C0002	This monitor checks if: • Defective / Missing Flyback Diode • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC monitors the solenoid back EMF. If it is above +40V then the Polaris triggers a Clamping Response. If this occurs on two consecutive shut-offs then the Clamp Activation bit is set and the coil output is shut off. Microprocessor receives the information via SPI from the ASIC	Microprocessor receives the information via SPI from the ASIC every 5 msec. If the Clamp Activation bit is set then the bit and coil output are reset to allow another test run until the Clamp Activation Fault has matured.	1. Coil Overcurrent DTC is not set 2. No CLAMP_ACTIVATION_FAILURE DTC is set 3. execute as part of Power-Up System Test, Periodic Coil Test or anytime ABS Iso is activated during performance	45 counts (minimum 3 failures in 10 attempts)	Type A. MIL Illumination.
CLAMP_ACTIVATION_FAILURE_PEDAL_SIM_ISO	C0024	This monitor checks if: • Defective / Missing Flyback Diode • Defective printed circuit board • Defective Polaris ASIC	Polaris ASIC monitors the solenoid back EMF. If it is above +40V then the Polaris triggers a Clamping Response. If this occurs on two consecutive shut-offs then the Clamp Activation bit is set and the coil output is shut off. Microprocessor receives the information via SPI from the ASIC	Microprocessor receives the information via SPI from the ASIC every 5 msec. If the Clamp Activation bit is set then the bit and coil output are reset to allow another test run until the Clamp Activation Fault has matured.	1. Coil Overcurrent DTC is not set 2. No CLAMP_ACTIVATION_FAILURE DTC is set 3. execute as part of Power-Up System Test, Periodic Coil Test or anytime ABS Iso is activated during performance	45 counts (minimum 3 failures in 10 attempts)	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
LEAKY_DRIVER_UNKNOWN_ABS_CIRCUITS	C0024	This monitor checks if: • Defective FET • Defective printed circuit board	• Slip Control Power Switch must be commanded ON than subsequently commanded OFF	If the Slip Control Power decreases at a rate that is faster than expected, fault will be set. If the power decreases from 100% to 30% in 1 msec, fault is set.	• Power Switch is ON, then OFF • will only be retested after a power cycle	1 Count	Type A. MIL Illumination.
LEAKY_DRIVER_UNKNOWN_BOOST_CIRCUITS	C0024	This monitor checks if: • Defective FET • Defective printed circuit board	• Slip Control Power Switch must be commanded ON than subsequently commanded OFF	If the Slip Control Power decreases at a rate that is faster than expected, fault will be set. If the power decreases from 100% to 30% in 1 msec, fault is set.	• Power Switch is ON, then OFF • will only be retested after a power cycle	1 Count	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_HIGH_ISO_FRONT_RIGHT	C0014	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_LOW_ISO_FRONT_RIGHT	C0014	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_HIGH_ISO_FRONT_LEFT	C0010	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_CC_DC_SATURATED_LOW_ISO_FRONT_LEFT	C0010	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_HIGH_ISO_REAR_RIGHT	C001C	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_LOW_ISO_REAR_RIGHT	C001C	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_HIGH_ISO_REAR_LEFT	C0018	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_CC_DC_SATURATED_LOW_ISO_REAR_LEFT	C0018	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_HIGH_NORMAL_OPEN_DAP	C0002	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_LOW_NORMAL_OPEN_DAP	C0002	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.
SOL_CC_DC_SATURATED_HIGH_PEDAL_SIM_ISO	C0024	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOL_CC_DC_SATURATED_LOW_PEDAL_SIM_ISO	C0024	This monitor checks if: Defective PCB Wiring	If a closed loop current control loop is broken, or if the target current is not physically achievable due to external limitations (e.g. coil resistance or supply voltage) or due the minimum on-time, the control loop's integrator shall cause the duty cycle command to saturate high or low. The time to reach saturation depends upon the tuning of the controller coefficients and the current feedback error.	Duty cycle is out of range	Polaris is initialized	100ms	Type A. MIL Illumination.
SOL_OVER_VOLTAGE_NORMAL_CLOSE_DAP	C0004	This monitor checks if: Defective/Missing Suppression diode Defective PCB	If the suppression diode is missing or failed the ASIC detects it by monitoring the solenoid back EMF. Reading above +40V sets the Overvoltage Warning SPI flag. The coils output is not shut-off by the ASIC. Software matures the fault by monitoring the SPI flag. NOTE: There are no suppression diodes on any of the Dump coils because they are not PWM'd.	Duty cycle is out of range	Polaris is initialized	5ms	Type A. MIL Illumination.
SOL_OVER_VOLTAGE_SIM_TEST	C05D5	This monitor checks if: Defective/Missing Suppression diode Defective PCB	If the suppression diode is missing or failed the ASIC detects it by monitoring the solenoid back EMF. Reading above +40V sets the Overvoltage Warning SPI flag. The coils output is not shut-off by the ASIC. Software matures the fault by monitoring the SPI flag. NOTE: There are no suppression diodes on any of the Dump coils because they are not PWM'd.	Duty cycle is out of range	Polaris is initialized	5ms	Type A. MIL Illumination.
DC_SOL_REGULATION_FAILURE	P0606	This monitor checks if: • Defective system ASIC	• The ASIC shall monitor the state of each DROx output and report if it does not match the commanded state.	The MCU shall monitor ASIC's "DROx Gate Monitor Fault" SPI bits.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SOL_DUTY_CYCLE_FDBK_PLAUS_FAULT	P0606	This monitor checks if: • Defective system ASIC ASIC cannot control sol current properly	The MCU shall monitor battery voltage and maintain an estimated coil temperature/resistance model. For a given current command, the MCU shall estimate the required duty cycle. The MCU shall verify that the estimated duty cycle against the ASIC's reported "CC_DRx Duty Cycle Command Feedback" match within a TBD tolerance. Current threshold is 20%	The MCU shall monitor battery voltage and maintain an estimated coil temperature/resistance model. For a given current command, the MCU shall estimate the required duty cycle. The MCU shall verify that the estimated duty cycle against the ASIC's reported "CC_DRx Duty Cycle Command Feedback" match within a TBD tolerance. Current threshold is 10%	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
COIL_CURRENT_FDBK_PLAUS_FAULT	P0606	This monitor checks if: • Defective system ASIC ASIC cannot control sol current properly	For CC_DRx channels in duty-cycle control mode: While a CC_DRx coil drive is commanded to greater than 0% duty cycle, the MCU shall monitor the ASIC's CC_DRx Current Result SPI field and verity the result matches the expected current. When a duty cycle command results in an CC_DRx on-time less than the minimum on time, no coil current measurement is possible. The reported CC_DRx Current Result will retain its prior value, and the corresponding Data Read bit will be 0. SW shall suspend SM102 while Data Read is 0.	For CC_DRx channels in duty-cycle control mode: While a CC_DRx coil drive is commanded to greater than 0% duty cycle, the MCU shall monitor the ASIC's CC_DRx Current Result SPI field and verity the result matches the expected current. When a duty cycle command results in an CC_DRx on-time less than the minimum on time, no coil current measurement is possible. The reported CC_DRx Current Result will retain its prior value, and the corresponding Data Read bit will be 0. SW shall suspend SM102 while Data Read is 0.	• Polaris is initialized • Coil Commanded in Duty Cycle mode	15 msec	Type A. MIL Illumination.
Group 4 - Electronic Control Unit (ECU)							
SPI_FAILURE_ASIC	P0606	This monitor checks if: • Defective printed circuit board. • Defective Polaris ASIC. • Defective microprocessor. • Noisy Power	• This fault can be set by problems communicating over SPI between the MICRO and the Polaris ASIC. It is checked ONCE at power up. • The SPI initialization will fail if the driver has not finished a previous transmission when a new transmission is required (not enough SPI throughput). • The SPI initialization will also fail if the driver detects an error (bad parity, control register data echo over the SPI or control register data read does not match). • If the Polaris ASIC fails to initialize SPI communication after 2 retries (3 attempts total) then this fault is set • Counter: Count 1-up • Monitor Rate: 1ms	Polaris Error Flag = TRUE Polaris.Error_Flags != 0 Polaris.Error_Flags_Observed |= Polaris.Error_Flags	• Power Switch is ON	3 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
FSC_SPI_TRANSMIT_FAILURE	P0606	This monitor checks if: • Defective printed circuit board. • Defective Polaris ASIC. • Defective microprocessor. • Noisy Power	• This fault can be set by problems communicating over SPI with the Polaris ASIC. The fault will set if the driver has not finished a previous transmission when a new transmission is required (not enough SPI throughout). The fault will also set if the driver detects an error (bad parity, control register data echo over the spi or control register data read does not match) in a single transmission and is unable to complete this transmission after 2 retries (3 attempts total). • Counter: Count 1-up • Monitor Rate: 1ms	Polaris Error Flag = TRUE Polaris.Error_Flags != 0 Polaris.Error_Flags_Observed |= Polaris.Error_Flags	• Power Switch is ON	3 ms	Type A. MIL Illumination.
NVRAM_DEVICE_INOPERATIVE	P062F	This monitor checks if: • Problem in chip select line • fault in SPI driver related code/circuit.	• This fault is set 1. When SPI driver is unable to do message transfer 2. If unable to write or time out before write operation could complete. 3. If requested message transfer not in time (including wait time)	device operational flag = FALSE (error during read write request occured)	• Power Switch is ON	5ms	Type A. MIL Illumination.
NVRAM_WRITE_FAILURE	P062F	This monitor checks if: • Communication problem with NVRAM chip • NVRAM hardware problem • PCB problem	• This fault is detected by the NVRAM handler. The NVRAM handler verifies a successful write event by reading back the information that is expected to be stored in NVRAM and also verifying the checksum.	If the NVRAM handler detects an unsuccessful write event three times, the fault is set.	• Power Switch in ON	60 msec	Type A. MIL Illumination.
COIL_DRIVER_SPI_FAILURE	P0606	This monitor checks if: • SPI Noise • Part problem	• SPI Failure(SPI Overrun Failure) • This fault can be set by problems communicating over SPI with the Coil Driver ASIC. The fault will set if the driver has not finished a previous transmission when a new transmission is required (not enough SPI throughout). The fault will also set if the driver detects an error (bad parity, control register data echo over the spi or control register data read does not match) in a single transmission and is unable to complete this transmission after 2 retries (3 attempts total).	SPI communication to Coil Driver failed	• Power Switch is ON	3ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
EXT_WATCHDOG_FAIL	P0606	This monitor checks if: • Defective system ASIC	• None.	Periodically (e.g. once per ignition cycle), the MCU shall perform the following watchdog test (or equivalent): (1) Start with the Watchdog Counter Value SPI field = 0, the WDEN pin high, and all other "watchdog-enabled functions" otherwise enabled. (2) Verify Watchdog Status SPI bit is 0 and all "watchdog-enabled functions" are disabled. (3) Service watchdog until the Watchdog Counter Value = 6. Verify the conditions from (2) remain. (4) Set the WDEN pin low, then service the watchdog. (5) Confirm the Watchdog Counter Value = 7 and all "watchdog-enabled functions" are disabled. (6) Allow the watchdog to timeout, then set the WDEN pin high.	• Polaris is initialized	10 msec	Type A. MIL Illumination.
				(7) Confirm the Watchdog Counter Value = 0, Watchdog Status bit is 0, and all "watchdog-enabled functions" are disabled. Watchdog-enable functions are: (1) solid state relay driver pin (VDG), (2) the motor ½ bridge pre-driver pins (PDG and PRG), (3) the ENQ digital output pin, and (4) the low-side coil drivers (CC_DRx) and pre-drivers (DROx).			
AD_PERIPHERAL_TIME OUT_FAILURE	P060B	This monitor checks if: • Defective printed circuit board. • Defective Polaris ASIC. • Defective microprocessor.	• A/D Peripheral Timeout Failure • When reading an A/D channel, the software enters a "wait" loop where it looks for a bit in an A/D register to be set, indicating that the conversion is complete. A "timeout" mechanism exists that breaks out of the wait loop after 100 usec (well longer than it is ever expected to complete an A/D conversion) has elapsed. If this timeout mechanism is executed, a fault code is set. • Counter: Count 1-up • Monitor Rate: 10ms	Adc Port Lockup Detected = TRUE	• Power Switch is ON	5ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
AD_EVENT_LOCKUP	P060B	This monitor checks if: • Defective printed circuit board. • Defective Polaris ASIC. • Defective microprocessor.	A/D Event Lockup Failure Two detection methods: No A/D conversions in the last 5 msec: A counter is incremented when A/D conversion results are retrieved. Every 5 msec this counter is checked. If it is 0, then the AD_EVENT_LOCKUP fault will begin to mature. If greater than 0, then it is cleared. 2 consecutive failures are needed to set the fault. Adc_Synchronization_Failed flag is TRUE: The ASIC will set this flag TRUE when the conversion count (number of channels converted) is larger than what is expected (9). 2 consecutive failures are needed to set the fault.	Adc Lockup Count = 0 or Adc Synchronization Failed = TRUE	• Power Switch is ON	5ms	Type A. MIL Illumination.
SOLENOID_TIMEOUT_FAILURE	P0606	This monitor checks if: • Defective microprocessor. • Incorrect microprocessor application code.	• Solenoid Timeout Failure Each solenoid in the system is expected to generate a HET interrupt command to indicate the end of a solenoid pulse duration.. Each solenoid timeout interrupt results in logic that sums the total number of HET interrupts. This is done independently for each channel. At the completion of the System Self-Test, the number of valid HET interrupts, are compared. The total number of HET interrupts is expected to be equal to the number of solenoids in the system. If the number of interrupts that occurred does not equal the expected number, a failure is indicated and this fault is set. • After the system self test is complete, each solenoid is test again once per every 5 sec, as described above.	At least one solenoid fails to get all timeout interrupts for all 0.5 ms pulses	• Mode manager is normal mode • Power switch is not faulted • System is not initializing • System is not re-initializing • Engine is not being cranked • Diagnostic commands are not requested • System is not shutting down	5ms	Type A. MIL Illumination.
			• The fault is cleared when above condition does not exist. • Counter: Count 1-up • Monitor Rate: 10MS				

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SOLENOID_PERIODIC_INTERRUPT_FAILURE	P0606	This monitor checks if: • Defective microprocessor. Incorrect microprocessor application code, ex. Bad scheduler	HET Periodic Interrupt Failure Verifies that one particular High End Timer interrupt (HET) feedback; occurs every pass through the schedule loop time (10MS). This fault is set if no HET interrupt feedback has occurred for 3 consequentive schedule loop time (10MS). The HET interrupt feedback that is checked is the solenoid feedback interrupts, This Solenoid feedback interrupt is scheduled every interval of the operating system. The fault is cleared when above condition does not exist. Counter: Count 1-up-Reset Monitor Rate: 10MS	periodic het interrupt flag = FALSE (periodic interrupt did not occur)	Power Switch is ON	5ms	Type A. MIL Illumination.
SYS_ASIC_U3_SELECT_FAILURE	P0606	This monitor checks if: • Defective system ASIC	• If the external U3 FET is present, the ASIC shall set the U3 External FET SPI bit. • Provide a SPI bit which reports whether the internal or external U3 FET has been selected.	The MCU shall read the ASIC's U3 External FET status bit and compares against the expected value.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_WDEN_STATUS_CORR	P0606	This monitor checks if: • Defective system ASIC	• The ASIC shall provide the WDEN Status SPI bit which reflects the filtered state of the WDEN pin. The MCU shall monitor the ASIC's WDEN Status SPI flag and verify it is the expected value.	WDEN Status SPI flag <> WDEN PIN status	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_EXCESS_STARTUP	P0606	This monitor checks if: • Defective system ASIC	• During the power-on sequence, the ASIC shall monitor the U5, U3, and U1 voltages, with respect to the discharge voltage threshold. • If the power-on sequence is delayed (e.g. due to a slow U5, U3, U1, discharge), the ASIC shall report the Excessive Startup Time SPI flag.	The MCU shall monitor the ASIC's Excessive Startup Time SPI flag.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_ADC_REF_HIGH	P060B	This monitor checks if: • Defective system ASIC	• The ASIC shall provide three ADC test voltage channels fixed to internal voltage references: Vhigh (ADREFHI),Vlow (GND_Q1), and Vmid (ADREFHI/2).	Each software loop, the MCU shall read the ADC conversion results for the Vhigh, Vlow and Vmid ASIC ADC channels over SPI, and compare them against fixed detection thresholds. Note: This MCU requirement is the same as in SM137.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_ADC_REF_MID	P060B	This monitor checks if: • Defective system ASIC	• The ASIC shall provide three ADC test voltage channels fixed to internal voltage references: Vhigh (ADREFHI),Vlow (GND_Q1), and Vmid (ADREFHI/2).	Each software loop, the MCU shall read the ADC conversion results for the Vhigh, Vlow and Vmid ASIC ADC channels over SPI, and compare them against fixed detection thresholds. Note: This MCU requirement is the same as in SM137.	• Polaris is initialized	25 msec	Type A. MIL Illumination.
SYS_ASIC_ADC_REF_LOW	P060B	This monitor checks if: • Defective system ASIC	• The ASIC shall provide three ADC test voltage channels fixed to internal voltage references: Vhigh (ADREFHI),Vlow (GND_Q1), and Vmid (ADREFHI/2).	Each software loop, the MCU shall read the ADC conversion results for the Vhigh, Vlow and Vmid ASIC ADC channels over SPI, and compare them against fixed detection thresholds. Note: This MCU requirement is the same as in SM137.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_ADC_ATTN_BIT_STUCK	P060B	This monitor checks if: • Defective system ASIC	• The MCU shall periodically (e.g. once per ignition cycle) command each active (i.e. used) ASIC external ADC channel with the attenuation mode opposite of normal operation and verify that its attenuation enable feedback SPI bit is not stuck.	Any one of the 10 ASIC external ADC channel's attenuation enable feedback SPI bits is stuck	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_ADC_ATTN_FACTOR	P060B	This monitor checks if: • Defective system ASIC	• Each background conversion loop, the ASIC shall perform the conversion of the internal Vmid voltage both with and without the selectable attenuation switched in. The conversion results shall be stored respectively in the separate ADC Vmid with Attenuation Test Result and ADC Vmid Test Result SPI fields. • Each software loop, the MCU shall calculate the ASIC's ADC attenuation factor by reading the ADC Vmid with Attenuation Test Result and ADC Vmid Test Result SPI fields, calculate the ASIC's ADC attenuation factor by dividing the attenuated result by the non-attenuated result, and verify the resulting attenuation factor is within limits.	Calculated ADC attenuation factor < 0.6176 OR Calculated ADC attenuation factor > 0.6320	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_EXT_ADC_FAILURE	P060B	This monitor checks if: • Defective Polaris ASIC.	The ASIC reports the state of the attenuation (selected or not selected) for each external ADC channel via the "ADx Attenuation Feedback" SPI bits within the ADC result registers. For fault detection purposes, the feedback bits directly monitor the control signal state within the SAR Logic, as opposed to only echoing the "ADx Attenuation Select" command. Each time an ASIC external ADC channel is read over SPI, the SW also reads the "ADx Attenuation Feedback" bit and compare the result against the expected (i.e. commanded) attenuation setting.	Compare the ASIC external ADC channel read of SPI and the ADx Attenuation feedback bit against expected attenuation setting	• Polaris is initialized	15ms	Type A. MIL Illumination.
SYS_ASIC_SYNC_PULSE_DETECT	P0606	This monitor checks if: • Defective system ASIC	• ASIC provides SYNC ARMED SPI mapped bit that can be set and cleared through SPI, or cleared by detected valid SYNC rising edge event. • Provide un-armed SYNC edge detected SPI mapped bit.	Periodically (e.g. once per ignition cycle) the MCU shall send a rising edge on the SYNC pin, while the SYNC Armed SPI bit is low. The MCU shall verify that the Unarmed SYNC Edge Detected SPI flag is set.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_SPI_DETECT	P0606	This monitor checks if: • Defective system ASIC	• None.	Periodically, and within the fault response time, the MCU shall send separate SPI frames with: (1) an incorrect CRC (2) an incorrect number of SPI bits (3) an invalid command (invalid address) (4) invalid data The MCU shall then verify that the CRC is corrupted in the ASIC's response frame to each of the above errors.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_REGISTER	P0606	This monitor checks if: • Defective system ASIC	• The ASIC shall provide the Storage SPI register. The register contents shall have no effect on the ASIC operation. Register contents shall only be modified by a SPI write and not by any internal ASIC action.	Every major software loop (e.g. 5 - 10ms), the MCU shall perform a write to, normal mode read from and dump mode read from the Storage SPI register. Each loop, the value written shall change, and shall include checkerboard (0xAA, 0x55), walking 1s and walking 0s). The MCU shall verify the written and read values match. After performing a write to a safety critical SPI register, the MCU shall perform a read back of the same register, and verify that the contents were written. The read shall occur within the same software loop, in order to allow the MCU to correct any mis-write within the fault response time. Note: The read back refers to a separate read request, and is not the same as verifying the write echo.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_DUPL_SEED	P0606	This monitor checks if: • Defective system ASIC	• None.	The MCU shall detect if ASIC provides the same seed value 3 times in a row.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_AD_REFRESH_FAILURE	P060B	This monitor checks if: • Defective system ASIC	• The ASIC shall set the Data Read bit to indicate that an individual ADC result has been updated since the register was last read.	Each time an ASIC ADC channel is read over SPI, the MCU shall also read the Data Read bit. If the Data Read bit is not set, the MCU treats the result as old data. If the Data Read bit is not set and the time since the prior ADC read is longer than the ASIC ADCs background loop time, the MCU shall detect a fault Periodically (e.g. once per ignition cycle), the MCU shall read each ADC result register immediately 3 times in a row. If the Data Read bit is never low during the 3 reads, flag a fault that the Data Read bit is stuck high. Repeat for all ASIC ADC channels. Note: Because the ASIC could update the result register between two register reads (resulting in two high Data Read bits), 3 successive reads are required.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_AD_DATA_READ_STUCK	P060B	This monitor checks if: • Defective system ASIC	• The ASIC shall set the Data Read bit to indicate that an individual ADC result has been updated since the register was last read.	Periodically (e.g. once per ignition cycle), the MCU shall read each ADC result register immediately 3 times in a row. If the Data Read bit is never low during the 3 reads, flag a fault that the Data Read bit is stuck high. Repeat for all ASIC ADC channels. Note: Because the ASIC could update the result register between two register reads (resulting in two high Data Read bits), 3 successive reads are required.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_MISSING_SYNC_EDGE	P0606	This monitor checks if: • Defective system ASIC	• After a rising SYNC pin edge has occurred, the SW shall read the ASIC's "SYNC Armed Status" flag and detects if the bit is still high (indicating the rising SYNC pin edge was not detected).	The ASIC clears the "SYNC Armed" bit after a rising edge has occurred on the SYNC pin. The ASIC provides the "SYNC Armed Status" SPI flag, which reflects the state of the "SYNC Armed" SPI bit. After a rising SYNC pin edge has occurred, the SW reads the ASIC's "SYNC Armed Status" SPI bit and detects if the bit is still high (indicating the rising SYNC pin edge was not detected).	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
DC_SOL_ON_TIME_MON_FAILED	P0606	This monitor checks if: • Defective system ASIC ASIC is not controlling PWM properly	The ASIC shall monitor the filtered DRDx feedback voltage and shall provide an on-time counter (for each channel) which shall accumulate the QDRx on-time. At each valid SYNC edge, the ASIC shall latch the current accumulated value into the DRDx On-Time Feedback Register and clear the on-time counter. The MCU shall integrate the commanded on-time between valid SYNC pulses and verify it matches the ASIC's reported result. Current threshold is 250 * MICROSECOND	Compare the solenoid commanded on time to the measured on time. If the difference in the two times is >250 microsec for 10 consecutive checks then the fault is immediately matured	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_UNEXPECTED_SYNC_PULSE	P0606	This monitor checks if: • Defective Polaris ASIC.	• The MCU shall monitor the ASIC's Unarmed SYNC Edge Detected SPI bit and verify no expected SYNC pin edges have occurs. • After a rising SYNC pin edge has occurred (e.g. at the start of the next software loop), the MCU shall read the ASIC's SYNC Armed Status SPI bit and confirm that the rising SYNC pin edge occurred (in which case the bit will be low).	Fault will set if the MCU detects an unexpected sync pulse from the ASIC by monitoring the Unarmed SYNC Edge Detected SPI bit	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_SYNC_TIMEOUT	P0606	This monitor checks if: • Defective Polaris ASIC. • Defective microprocessor. • Operating system failure	The ASIC detects if the time since the prior valid rising SYNC edge exceeds the SYNC timeout time. Then the ASIC turns off the coil drivers and sets the "SYNC Timeout" SPI bit. The SW monitors the ASIC's "SYNC Timeout" SPI bit to detect if a SYNC Timeout has occurred.	This fault would be set if the SPI bit SYNC Timeout is set for 25msec	• Polaris is initialized	max 17ms	Type A. MIL Illumination.
SYS_ASIC_CONFIG_REG_FAILURE	P0606	This monitor checks if: • register error • register rewrite error	• Configuration Registers: (These are written once at startup.) After writing once, read back and verify their contents during every subsequent 5ms SPI loop.	Rewrite registers with an incorrect value Verify if the write was successful during the following 5ms SPI loop's read & verify. If the rewrite is not successful after 3 attempts in a row, set a fault.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_CONTROL_REG_FAILURE	P0606	This monitor checks if: • register error • register rewrite error	• Control Registers: (These are written every 5ms loop for control or failsafing purposes.) For those registers not covered by other SMs, read and verify every 5ms loop, prior to performing the write.	Rewrite registers with an incorrect value Verify if the write was successful during the following 5ms SPI loop's read & verify. If the rewrite is not successful after 3 attempts in a row, set a fault.	• Polaris is initialized	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ENQ_PIN_FAILED	P0606	This monitor checks if: • Defective ASIC.	• The Polaris ASIC provides a digital push-pull output, ENQ. ENQ is high when the ENQ Enable SPI bit is set, the Watchdog Status is "in range", WDEN Status is high, and nRST Status is high. Otherwise ENQ is low. ENQ is used as a pre-driver to enable ECU circuitry.	The MCU shall continuously monitor the ASIC ENQ feedback signal state and verify that it has the expected state. The HW shall provide a digital feedback signal of ASIC ENQ signal to MCU digital input.	• Polaris is initialized	10 msec	Type A. MIL Illumination.
BROKEN_WIRE_BPWM_SWITCH_1	P060B	This monitor checks if: • Improper (broken wire) connection between the external analog sensor and the input pin. • Defective microprocessor.	• Conversion results for VHigh and VLow ADC channels are out of range, then Broken Wire fault is set.	• Each software loop, ADC conversion results for VHigh and VLow MMC ADC Channels are read. • If conversion results for VHigh and VLow are out of range, then Broken Wire fault is set.	• Power Switch is ON	5 msec	Type A. MIL Illumination.
BROKEN_WIRE_BPWM_SWITCH_5	P060B	This monitor checks if: • Improper (broken wire) connection between the external analog sensor and the input pin. • Defective microprocessor.	• Conversion results for VHigh and VLow ADC channels are out of range, then Broken Wire fault is set.	• Each software loop, ADC conversion results for VHigh and VLow MMC ADC Channels are read. • If conversion results for VHigh and VLow are out of range, then Broken Wire fault is set.	• Power Switch is ON	5 msec	Type A. MIL Illumination.
BROKEN_WIRE_BFL_SWITCH_2	P060B	This monitor checks if: • Improper (broken wire) connection between the external analog sensor and the input pin. • Defective microprocessor.	• Conversion results for VHigh and VLow ADC channels are out of range, then Broken Wire fault is set.	• Each software loop, ADC conversion results for VHigh and VLow MMC ADC Channels are read. • If conversion results for VHigh and VLow are out of range, then Broken Wire fault is set.	• Power Switch is ON	5 msec	Type C, No MIL, "Emissions Neutral Diagnostic "
BROKEN_WIRE_TEMP_FDBK_A	P060B	This monitor checks if: • Improper (broken wire) connection between the external analog sensor and the input pin. • Defective microprocessor.	• Conversion results for VHigh and VLow ADC channels are out of range, then Broken Wire fault is set.	• Each software loop, ADC conversion results for VHigh and VLow MMC ADC Channels are read. • If conversion results for VHigh and VLow are out of range, then Broken Wire fault is set.	• Power Switch is ON	5 msec	Type A. MIL Illumination.
BROKEN_WIRE_COIL_THREE_WAY_PRIMARY_FDBK_A	P060B	This monitor checks if: • Open coil detection • Defective microprocessor.	• Broken wire faults is set when the low side driver drain feedback is not at expected value when coil and Base Brake Safety switch is commanded ON.	• The MCU monitors the low side driver drain feedback to determine an open coil failure while coil is commanded OFF and Base Brake Safety switch is commanded ON every 5msec. • Broken wire faults is set when the low side driver drain feedback is not at expected value when coil and Base Brake Safety switch is commanded ON.	• Power Switch is ON	30 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
BROKEN_WIRE_COIL_THREE_WAY_SECONDARY_FDBK_A	P060B	This monitor checks if: • Open coil detection • Defective microprocessor.	• Broken wire faults is set when the low side driver drain feedback is not at expected value when coil and Base Brake Safety switch is commanded ON.	• The MCU monitors the low side driver drain feedback to determine an open coil failure while coil is commanded OFF and Base Brake Safety switch is commanded ON every 5msec. • Broken wire faults is set when the low side driver drain feedback is not at expected value when coil and Base Brake Safety switch is commanded ON.	• Power Switch is ON	30 msec	Type A. MIL Illumination.
SYS_ASIC_U1_SELECT_FAILURE	P0606	This monitor checks if: • Defective printed circuit board. • Defective ASIC. • Defective microprocessor.	• The U1 operating mode and voltage level selections are viewable via the U1 Mode Select Status and U1 Voltage Select Status SPI fields. The SPI feedback signals are internally routed so that they monitor the true state of the mode and voltage control circuits.	The MCU verifies that the U1 Mode Select Status and U1 Voltage Select Status SPI fields in register 0x45 match the values which are hard-coded into SW corresponding the application's intended HW population. If a mismatch is detected, fault is set.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_NVM_FAIL	P062F	This monitor checks if: • Defective printed circuit board. • Defective ASIC. • Defective microprocessor.	• During the ASIC's full active logic reset sequence (within the active mode), the ASIC shall read and compare the primary and inverted U1 mode and voltage SPI fields. • If primary and inverted SPI fields do not match, the ASIC shall configure the U1 regulator in the 1.1V, supervisor mode configuration and shall set the TRW NVM Fail SPI bit in registers 0x45 and 0x61.	The MCU shall periodically verify that the TRW NVM Fail SPI bit (reg 0x45) is low. If the bit is read as high, fault is set.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_SM_DISABLED	P0606	This monitor checks if: • Defective printed circuit board. • Defective ASIC. • Defective microprocessor.	• The ASIC shall set the Safety Mechanisms Disabled SPI bit when a test mode is active which prevents the ASIC from resetting the MCU or disabling power supplies in reaction to a fault.	The MCU shall periodically verify that the Safety Mechanisms Disabled SPI bit is low. If the bit is read as high, fault is set.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_SPI_TRANSFER_ERROR	P0606	This monitor checks if: • SPI transfer error • ASIC problem • PCB problem	• The micro monitors the SPI data transmissions and checks for SPI transfer errors	If any of the below errors are observed in Spi Data transmission this fault will set. POLARIS_SPI_NOT_INITIALIZED POLARIS_SPI_TRANSFER_REJECTED POLARIS_SPI_TX_MSG_LENGTH_ERROR	• Continuous failsafing	15 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
Group 5 - Microcontroller							
ROM_CRC_FAILURE	P0606	This monitor checks if: • Defective microprocessor • Incorrect fault detection algorithm	• CRC ROM Failure R4 • The ROM self-test is a dynamic test that is called from the scheduler at a rate of 5 msec. Each ROM section is checksummed byte by byte. Each byte will be added to the current checksum for a section. If the byte being checked is the last byte of a section, then the setion is verified for a correct checksum stored at the end of the section.	calculated CRC != stored CRC	• Power Switch is ON	5 msec	Type A. MIL Illumination.
LMU_DATA_PATH_TEST_FAILURE	P0606	This monitor checks if: Permanent failure of the LMU (Local Memory Unit) SRAM data path	The fault will be set if the data written to the LMU SRAM does not match the data read back from the same location of the LMU SRAM	The test consists of the following sequence: 1. Write 8 different 8-bit values to sequential addresses in LMU SRAM. Data pattern: 0x1122334455667788 2. Perform a 64-bit read and compare against expected values 3. Write 4 different 16-bit values to sequential addresses in LMU SRAM. Data pattern: 0xEEDDCCBBAA998877 4. Perform a 64-bit read and compare against expected values 5. Write 2 different 32-bit values to sequential addresses in LMU SRAM. Data pattern: 0xA5A5A5A5A5A5A5A5 6. Perform a 64-bit read and compare against expected values	Always runs during initialization	1 Count	Type A. MIL Illumination.
SPINLOCK_FAULT_BUFFER_ERROR	P0606	This monitor checks if: Software Error CPU Failure	Spinlock variable fails to go to available value before timeout expires.	None	Always Enabled	10	Type A. MIL Illumination.
SPINLOCK_ONSTAR_FAULT_LATCHED_ERROR	P0606	This monitor checks if: Software Error CPU Failure	Spinlock variable fails to go to available value before timeout expires.	None	Always Enabled	10	Type A. MIL Illumination.
SPINLOCK_ONSTAR_FAULT_CLEARED_ERROR	P0606	This monitor checks if: Software Error CPU Failure	Spinlock variable fails to go to available value before timeout expires.	None	Always Enabled	10	Type A. MIL Illumination.
SPINLOCK_FMM_BLOCK_ERROR	P0606	This monitor checks if: Software Error CPU Failure	Spinlock variable fails to go to available value before timeout expires.	None	Always Enabled	10	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SPINLOCK_NVRAM_FAULT_BIT_ERROR	P062F	This monitor checks if: Software Error CPU Failure	Spinlock variable fails to go to available value before timeout expires.	None	Always Enabled	10	Type A. MIL Illumination.
OS_TASK_MONITOR_FAULT_CORE0	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	Checks to be sure that all tasks on CPU0 are running	None	Always Enabled	1 count	Type A. MIL Illumination.
OS_TASK_MONITOR_FAULT_CORE1	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	Checks to be sure that all tasks on CPU1 are running	None	Always Enabled	1 count	Type A. MIL Illumination.
OS_TASK_MONITOR_FAULT_CORE2	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	Checks to be sure that all tasks on CPU2 are running	None	Always Enabled	1 count	Type A. MIL Illumination.
OS_INTERNAL_FAILURE_CORE0	P0606	This monitor checks if: Failure in a hardware system that the OS depends on.	The OS has detected a serious failure such that, as determined by the OS vendor, it cannot continue safe operation on at least 1 CPU. This is most likely because of a failure in a hardware system that the OS depends on.	None	Always Enabled	10 msec	Type A. MIL Illumination.
OS_INTERNAL_FAILURE_CORE1	P0606	This monitor checks if: Failure in a hardware system that the OS depends on.	The OS has detected a serious failure such that, as determined by the OS vendor, it cannot continue safe operation on at least 1 CPU. This is most likely because of a failure in a hardware system that the OS depends on.	None	Always Enabled	10 msec	Type A. MIL Illumination.
OS_INTERNAL_FAILURE_CORE2	P0606	This monitor checks if: Failure in a hardware system that the OS depends on.	The OS has detected a serious failure such that, as determined by the OS vendor, it cannot continue safe operation on at least 1 CPU. This is most likely because of a failure in a hardware system that the OS depends on.	None	Always Enabled	10 msec	Type A. MIL Illumination.
RTOS_FAILURE_CORE0	P0606	This monitor checks if: Software Error	EB OS detects an error situation and calls ErrorHook with a status code for which there is no other fault code.	None	Always Enabled	5*Number of errors in 10ms update Cycle	Type A. MIL Illumination.
RTOS_FAILURE_CORE1	P0606	This monitor checks if: Software Error	EB OS detects an error situation and calls ErrorHook with a status code for which there is no other fault code.	None	Always Enabled	5*Number of errors in 10ms update Cycle	Type A. MIL Illumination.
RTOS_FAILURE_CORE2	P0606	This monitor checks if: Software Error	EB OS detects an error situation and calls ErrorHook with a status code for which there is no other fault code.	None	Always Enabled	5*Number of errors in 10ms update Cycle	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
UNEXPECTED_EXCEPTION_CORE0	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	The CPU detects a situation where it cannot successfully complete an instruction, such no memory exists at the read/write address or instruction code is invalid. The CPU branches to a predefined Trap address and control is transferred to the Elektrobit OS. The EB OS will call ProtectionHook with status code E_OS_PROTECTION_EXCEPTION provided the following two aspects are true. 1 – The trap was not a normal function of the OS. 2 – The OS does not have another more specific error code to use, such as E_OS_PROTECTION_MEMORY for a MPU violation.	None	Always Enabled	10	Type A. MIL Illumination.
UNEXPECTED_EXCEPTION_CORE1	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	The CPU detects a situation where it cannot successfully complete an instruction, such no memory exists at the read/write address or instruction code is invalid. The CPU branches to a predefined Trap address and control is transferred to the Elektrobit OS. The EB OS will call ProtectionHook with status code E_OS_PROTECTION_EXCEPTION provided the following two aspects are true. 1 – The trap was not a normal function of the OS. 2 – The OS does not have another more specific error code to use, such as E_OS_PROTECTION_MEMORY for a MPU violation.	None	Always Enabled	10	Type A. MIL Illumination.
UNEXPECTED_EXCEPTION_CORE2	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	The CPU detects a situation where it cannot successfully complete an instruction, such no memory exists at the read/write address or instruction code is invalid. The CPU branches to a predefined Trap address and control is transferred to the Elektrobit OS. The EB OS will call ProtectionHook with status code E_OS_PROTECTION_EXCEPTION provided the following two aspects are true. 1 – The trap was not a normal function of the OS. 2 – The OS does not have another more specific error code to use, such as E_OS_PROTECTION_MEMORY for a MPU violation.	None	Always Enabled	10	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
FSMC_MISMATCH_VELOCITY	P0606	This monitor checks if: • Defective • Microprocessor • At least one • wheel velocity • calculation • between • Micro 1 and • Micro 2 does not agree	• Mismatched Wheel Velocity Failure • Both micro 1 and micro 2 are calculating the velocity for each wheel. All wheel speeds computed by the micro 1 are transmitted to the micro 2 every loop time. The micro 2 compares them to the appropriate velocities received from the micro 1.	Tolerance of any wheel velocity calculations is > +/- 10 km/h	• High wheel acceleration inhibits this routine	35 ms	Type A. MIL Illumination.
LOGICAL_SEQUENCE_FAULT_CORE0	P0606	This monitor checks if: Improper sequencing of runnables	If the software finds mismatch in current sequence compared to predefined sequence of the runnables then LSM flag in Core 0 is set.	Fault is set if LSM flag in Core 0 is set.	Continuous Failsafing	1 count	Type A. MIL Illumination.
LOGICAL_SEQUENCE_FAULT_CORE1	P0606	This monitor checks if: Improper sequencing of runnables	If the software finds mismatch in current sequence compared to predefined sequence of the runnables then LSM flag in Core 1 is set.	Fault is set if LSM flag in Core 1 is set.	Continuous Failsafing	1 count	Type A. MIL Illumination.
LOGICAL_SEQUENCE_FAULT_CORE2	P0606	This monitor checks if: Improper sequencing of runnables	If the software finds mismatch in current sequence compared to predefined sequence of the runnables then LSM flag in Core 2 is set.	Fault is set if LSM flag in Core 2 is set.	Continuous Failsafing	1 count	Type A. MIL Illumination.
CPU_FAILURE_SEVERITY_X	P0606	This monitor checks if: • Defective microprocessor • Improper Application Code	• This failsafe is designed to detect when an unexpected interrupt has occurred	Fault is set when one of errors occur once: RAM ECC error RAM access error DMA error HET/NHET error MibSPI error PLL error CCM error	• Power Switch in ON	10msec	Type A. MIL Illumination.
CPU_FAILURE_SEVERITY_Y	P0606	This monitor checks if: • Defective microprocessor • Improper Application Code	Activates the FSP then checks to see if it truly got activated. Also checks to see if the ASIC saw the FSP pin activate.	If Polaris FSP test failed OR If Aurix FSP test failed	• Power Switch in ON	Checked every 20ms or instantaneously	Type A. MIL Illumination.
CPU_FAILURE_SEVERITY_TRANSIENT	P0606	This monitor checks if: • Defective microprocessor • Improper Application Code	The SW shall configure the MCU's fault manager to signal MCU faults which require an external warm-reset on the MCU.	The ASIC monitors the nERROR pin. If an external reset of the MCU is required the MCU asserts the nERROR pin to low for the nERROR debounce time. Then the ASIC then asserts the nRST pin to warm-reset the MCU.	• Power Switch in ON	10msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_SYNC_TIME_MISMATCH_FAULT	P0606	This monitor checks if: • Defective system ASIC	• At each valid SYNC edge, the ASIC shall store the time between that edge and the prior valid SYNC edge in the Prior SYNC Interval Time SPI register field.	The MCU shall measure time between SYNC edges (based upon the MCU clock) and verify the time matches the ASIC's Prior SYNC Interval Time SPI field.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_TARGET_CURRENT_DETECT	P0606	This monitor checks if: When any ABS ISOs, NO DAP or PEDAL_SIM solenoids are: • Shorted Solenoid OR • Open Solenoid Driver OR • Open Flyback diode	• None.	Periodically (e.g. once per ignition cycle), the MCU shall command the maximum coil current with the solid state relay off and verify that the ASIC sets the "CC_DRx High Target Unreachable" SPI flag. The MCU shall also command the minimum non-zero coil current with the solid state relay on and verify that the ASIC sets the "CC_DRx Low Target Unreachable" SPI flag. This test shall be performed on all CC_DRx channels.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_DRIVER_SHORT_DETECT	P0606	This monitor checks if: • Defective system ASIC	• The ASIC shall not automatically inhibit the Shorted Driver Detection (SM37) when the SSR is off.	Periodically (e.g. once per ignition cycle), the MCU shall disable the SSR, enable the CC_DRx and DROx drivers, command 0A or 0% duty cycle, and verify that the Open Coil / Shorted Driver Warning Valid bits are set, and verify that a Shorted Driver Warning is reported on each driver channel.	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_SSR_SELF_TEST_FAILED	P0604	This monitor checks if: • Solid State Relay problem • Defective ASIC • PCB problem	• The MCU performs various tests on the Solid State Relay during System Self Test.	(1a) Se/Command: Watchdog Counter Value SPI field = 0, WDEN pin low, the Enable Failsafe SSR SPI bit = 0, and the SSR Shut Off Pin low (= off). (1b) Verify the Coil Supply Voltage is low. (2a) Set the WDEN pin high, the Enable Failsafe SSR SPI bit = 1, and the SSR Shut Off Pin high (= on). Do not service the Watchdog. (2b) Verify the Coil Supply Voltage is low. (3a) Service Watchdog until the Watchdog Counter Value SPI field = 6. (3b) Verify the Coil Supply Voltage is low. (4a) Set the WDEN pin low, then service the Watchdog once, such that the Watchdog Counter Value SPI field = 7.	• Runs during initialization	30 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
				(4b) Verify the Coil Supply Voltage is low. (5a) Set the Enable Failsafe SSR SPI bit = 0, then set the WDEN pin high. (5b) Verify the Coil Supply Voltage is low. (6a) Set the SSR Shut Off Pin low (= off), then set the Enable Failsafe SSR SPI bit = 1. (6b) Verify the Coil Supply Voltage is low. (7a) Allow the Watchdog to timeout, then set the SSR Shut Off Pin high (= on). The time between (4a) and (7a) should be counted toward the required timeout time. If the time between (4a) and (7a) is more than 34ms, a watchdog service event must be added in-between to prevent the Watchdog from timing out before (7a).			
				(7b) Verify the Coil Supply Voltage is low and verify the Watchdog Counter Value SPI field = 0. If any of the above tests failed , retry the re enable all the inputs that are being disabled for this test, and re run this test two more times. If it is still failed then set the fault. If any of the above tests failed , retry the re enable all the inputs that are being disabled for this test, and re run this test two more times. If it is still failed then set the fault.			
SYS_ASIC_WDOG_COUNT_TEST_FAILED	P0606	This monitor checks if: • Watchdog problem • Defective ASIC • PCB problem	• This fault tests the watchdog by purposefully allowing the watchdog to time out and checking to see how the watchdog reacts	Allow the Watchdog to timeout. Timeout shall occur 34ms to 42ms after the last watchdog service occurred, The time taken to timeout the watchdog counter should be counted toward the required timeout time. If the time is not in a range of 34 to 42 msec this fault should set	• Runs during initialization	34 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WDOG_DYNAMIC_TEST_FAILURE	P0606	This monitor checks if: • Defective printed circuit board. • Defective ASIC. • Defective microprocessor.	• Watchdog Dynamic Test Failure • The micro sends a bad watchdog response value back to the ASIC periodically to verify that the ASIC does move towards disabling the system when the watchdog is not correctly being updated. Each loop, the watchdog status counter is checked. After the bad value is sent, the logic tests the status counter to verify that it moved towards disabling the system. If the ASIC operation did not move towards disabling the system, the logic assumes that the watchdog is not able to function properly. As a result, the logic disables the system because the watchdog operation cannot be assumed to be correct. 2 occurrences of this failure is needed to set the fault.	If the ASIC operation has not moved towards disabling the system, the logic assumes that the watchdog is not able to function properly. As a result, the logic disables the system because the watchdog operation cannot be assumed to be correct. 2 occurrences of this failure is needed to set the fault.	• Power Switch is ON	10 msec	Type A. MIL Illumination.
SYS_ASIC_U1_UV_RESET_FAULT	P0606	This monitor checks if: • ASIC power supply block problem • Defective ASIC • PCB problem	When the U5 or U3 Undervoltage Diagnostic SPI bit is set, the ASIC raises the effective U5 out of range lower warning level, or the U3 undervoltage fault threshold above the maximum U5 or U3 regulation voltage, thus forcing a U5 out of range warning or U3 undervoltage fault. Periodically, the MCU shall store a flag in NVM indicating that it will perform a U5, U3 or U1 undervoltage diagnostic. The MCU shall then force one of the three test modes and start a timer.	The MCU shall detect a fault if it does not receive a reset within the expected time. If a reset occurs, the MCU shall check NVM and the ASIC's Reset Source SPI Register, and verify that the reset was due to a planned test.	• Runs during initialization	10 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_OSCI_RESET_TEST_FAULT	P0606	This monitor checks if: • Oscillator problem • Defective ASIC • PCB problem	• The ASIC shall provide a means to periodically verify that the ASIC is capable of detecting an Oscillator Fault condition and entering the Oscillator Fault Power-down Mode. • From within TRW Test Mode, the ASIC shall provide Main and Supervisor Oscillator Diagnostic bits, which are capable of diving the main oscillator frequency by 2, stopping the main oscillator, dividing the supervisor oscillator frequency by 2, and stopping the supervisor oscillator. • Periodically (e.g. once per ignition cycle) the MCU shall store a flag in NVM indicating that it will perform a oscillator diagnostic. The MCU shall then force one of the four oscillator test modes and start a timer.	The MCU shall detect a fault if it does not receive a reset within the expected time. If a reset occurs, the MCU shall check NVM and the ASIC's Reset Source SPI Register, and verify that the reset was due to a planned test.	• Runs during initialization	10 msec	Type A. MIL Illumination.
SYS_ASIC_LOGIC_RST_STUCK_DETECT	P0606	This monitor checks if: • Reset source register problem • ASIC problem • PCB problem	• The MCU continuously monitors the External LOGIC_RST Reset SPI bit within the Reset Source Register.	The MCU shall read the ASIC's External LOGIC_RST Reset SPI field. If the SPI bit is high, fault is set.	• Continuous failsafing	30 msec	Type A. MIL Illumination.
MULTIPLE_STARTUP_FAILURE	P0606	This monitor checks if: • Defective CPU	The library of micro safety tests are run at every power-up. If any test fails the results are stored and the system is soft reset. If after the reset, any different test or procedure fails then a MULTIPLE_STARTUP_FAILURE is latched	Any two different Safety Test flags are reported as FAILED in two consecutive tests	Enabled at power up	1 count	Type A. MIL Illumination.
SBST_CORE2_FAILURE	P0606	This monitor checks if: Failure of the CPU core	Fault is set if SafeTlib test "CpuTst_CpuSbstPTst()" fails	Every 1 second the SafeTlib test "CpuTst_CpuSbstPTst()" is run. The fault is set if it returns a failure.	Continous - Always enabled	1 Count	Type A. MIL Illumination.
UNIMPLEMENTED_INTERRUPT_CORE0	P0606	This monitor checks if: Defective CPU	When the failsafe is called during runtime, it will loop through all the SRC registers to find if there is any pending interrupt from disabled interrupt source	If SRPN bits in SRC register of Interrupt router is zero then the fault will set if SRR bit of SRC register is set	Continuous Failsafing	300 counts	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ADC_FAILURE	P060B	This monitor checks if: • Defective CPU	Fault sets under the following circumstances: An AD pin is read. Using the Conversion Diagnostics, a pull down is tied to the pin and read again. Then, a pull up is tied to the pin, and read again. Then, the pull devices are removed, and the pin is read a 4th time. The fault will be set if the pull down did not pull the value down by at least 20%, or, the pull up did not pull the value up by at least 20%, or the reread value changed from the initial value by more than 3%. Repeat on another AD pin.	If (pulled down value read > initial value read * 0.8) OR If (pulled up value read < initial value read * 1.2) OR If (reread value > initial value read*1.03) OR If (reread value < initial value read *0.97) THEN Set ADC_FAILURE	performed at power up	1 count	Type A. MIL Illumination.
RESET_SSCHECK_FAILURE	P0606	This monitor checks if: • Defective CPU	After a warm reset the RSTCON2.CSS bits are checked. If any are 0, then the fault will be set	If (warm reset == TRUE) AND (RSTCON2.CSS == 0)	performed at power up	1 count	Type A. MIL Illumination.
SPB_FAILURE	P0606	This monitor checks if: failed System Peripheral Bus	The correct value of different registers shall be tested to ensure the proper functioning of the SPB address lines. Fault set if any of the registers have an unexpected value after 5 consecutive checks in the 20 ms task .	Each of the required registers will be read during runtime to see if they provide the expected value that was loaded during initialization.	Power Switch is ON	100msec	Type A. MIL Illumination.
SMU_CONFIG_REGISTER_READBACK_FAILURE	P0606	This monitor checks if: • Defective CPU	after the SMU has been initialized it will loop through a table of SMU registers and compare each register value to the value that the MCAL has previously written to it. If there is a difference, then the SMU will be unlocked, the register updated, and then the SMU will be put back to it's previous state. The register will then be checked again. If it fails 3 times, then the SMU_CONFIG_REGISTER_READBACK_FAILURE will be set.	register value is not equal to test value written to it	performed at power up	1 count	Type A. MIL Illumination.
SBCU_CONFIG_REGISTER_READBACK_FAILURE	P0606	This monitor checks if: • Defective CPU	after the SMU has been initialized it will loop through a table of SMU registers and compare each register value to the value that the MCAL has previously written to it. If there is a difference, then the SMU will be unlocked, the register updated, and then the SMU will be put back to it's previous state. The register will then be checked again. If it fails 3 times, then the SMU_CONFIG_REGISTER_READBACK_FAILURE will be set.	register value is not equal to test value written to it	performed at power up	1 count	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
WDT_CONFIG_REGISTER_READBACK_FAILURE	P0606	This monitor checks if: • Defective CPU	On initialization: One or more of these Safety Watchdog registers has an incorrect value: WDTSCON0.REL WDTSCON1.IR0 WDTSCON1.IR1 WDTSCON1.DR WDTSCON1.UR WDTSCON1.TCTR During runtime: One or more of these CPU0 Watchdog registers has an incorrect value for 4 consecutive checks: WDTCPU0CON0.REL WDTCPU0CON1.IR0 WDTCPU0CON1.IR1 WDTCPU0CON1.DR WDTCPU0CON1.UR WDTCPU0CON1.TCTR	any register has an incorrect value for four consecutive checks	Enabled at power up	4 count	Type A. MIL Illumination.
CPU_BUS_MPU_CONFIG_REGISTER_READBACK_FAILURE	P0606	This monitor checks if: • Defective CPU	after the MPU has been initialized it will loop through a table of MPU registers and compare each register value to the value that the MCAL has previously written to it. If there is a difference, then the MPU will be unlocked, the register updated, and then the SMU will be put back to it's previous state. The register will then be checked again. If it fails 3 times, then the CPU_MPU_CONFIG_REGISTER_READBACK_FAILURE will be set.	register value is not equal to test value written to it	performed at power up	1 count	Type A. MIL Illumination.
LMU_MPU_CONFIG_REGISTER_READBACK_FAILURE	P0606	This monitor checks if: • Defective CPU	after the MPU has been initialized it will loop through a table of MPU registers and compare each register value to the value that the MCAL has previously written to it. If there is a difference, then the MPU will be unlocked, the register updated, and then the SMU will be put back to it's previous state. The register will then be checked again. If it fails 3 times, then the CPU_MPU_CONFIG_REGISTER_READBACK_FAILURE will be set.	register value is not equal to test value written to it	performed at power up	1 count	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PB_MICRO_REGISTER_READBACK_FAILURE	P0606	This monitor checks if: • Defective CPU	The ECU provides the capability to ensure the data integrity of register configuration. The software shall ensure the data integrity of the register configuration and compare the calculated checksum against an expected value.	register value is not equal to test value written to it	performed at power up	1 count	Type A. MIL Illumination.
SAFETY_LIB_DETECTED_FAILURE	P0606	This monitor checks if: • Defective CPU	The library of micro safety tests are run at every power-up. If any test fails the results are stored and the system is soft reset. If after the reset, the same test or procedure fails then a SAFETY_LIB_DETECTED_FAILURE is latched	Any one Safety Test flag is reported as FAILED in two consecutive tests	Enabled at power up	1 count	Type A. MIL Illumination.
STM_PLAUSIBILITY_FAILURE	P0606	This monitor checks if: • Defective CPU	STM and TBU timers are read without interrupt between, then after 20 ms, STM and TBU elaspsed times are read without interrupt between the readings, the 2.5% error is checked and Up/down failsafe monitor function is called. The fault is continiously checked every 20 ms.	The difference between the System Timer and Time Base Unit channel 1 >= 2.5%	Enabled at power up	105 msec	Type A. MIL Illumination.
EVR_CFGMON_FAILURE	P0606	This monitor checks if: • Defective CPU	The Power Management Status Register is checked at power-up. Two configuration bits are checked. Also the EVR Active flag is checked.	If any of the checked flags are FALSE then the fault is set immediately	performed at power up	1 count	Type A. MIL Illumination.
RAM_STARTUP_MBIST_FAILURE	P0604	This monitor checks if: • Defective CPU	The micro runs a RAM self test at power-up. If a failure is detected the the BIST is rerun after a warm reset. If a failure still exists then the failed bit will be set	If the failed bit is TRUE then set the fault	performed at power up	1 count	Type A. MIL Illumination.
Group 7 - IBC Motor							
MD_PU_I_SENSE_COMMON_MODE_FAULT	C0596	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	If {common mode Isense offset - zero Isense offset} is outside the normal range (+/- SPUT_ISENSE_MAX_CM_ISHIFT), this fault is set.	If the current sampled at power-up with an injected common mode I-sense offset (positive & negative together), is outside +/- maximum common mode offset range (from the zero offset reading), this fault is raised.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_PU_I_SENSE_NEGATIVE_FAULT	C0596	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	If {zero Isense offset - negative Isense offset } is outside the normal range (SPUT_ISENSE_MIN_NEG_ISHIFT to SPUT_ISENSE_MAX_NEG_ISHIFT), this fault is set	If the current sampled at power-up with an injected negative I-sense offset, is outside minimum to maximum negative offset range (from the zero offset reading), this fault is raised.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1 ms	Type A. MIL Illumination.
MD_PU_I_SENSE_POSITIVE_FAULT	C0596	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	If {positive Isense offset - zero Isense offset} is outside the normal range (SPUT_ISENSE_MIN_POS_ISHIFT to SPUT_ISENSE_MAX_POS_ISHIFT), this fault is set.	If the current sampled at power-up with an injected positive I-sense offset, is outside minimum to maximum positive offset range (from the zero offset reading), this fault is raised.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1 ms	Type A. MIL Illumination.
MD_IEM_OCCURRENCE_FAULT	C0582	This monitor checks if: • Bridge FET failure • Invalid execution rate of a motor interrupt.	Compares the number of times each electric drive interrupt has occurred in a 4ms period, and sets if the interrupt count does not fall in an acceptable range	The occurrence counter of any enabled motor interrupt is outside an expected interval.	ECU is not shutting down.	1 count/4 ms	Type A. MIL Illumination.
MD_IEM_PLAUSIBILITY_FAULT	C0582	This monitor checks if: • Bridge FET failure • Invalid execution reason of a motor interrupt.	This fault sets if a motor control interrupt is executed with the wrong proirity level, or an interrupt is executed when it should be disabled.	Either a motor interrupt has been executed which wasn't explicitly enabled.	Motor Drive is in either "Running" or "Paused" state (i.e. not in "Init" or intermediate "Resuming" or "Terminated" state)	1 count	Type A. MIL Illumination.
MD_MOTOR_PHASE_VOLTAGE_1_HIGH_FAULT	C057F	This monitor checks if: Bridge FET failure	When phase 1 voltage is high, the microcontroller shall capture {M1_PH1_SEN phase voltage high}, if {M1_PH1_SEN phase voltage high} is less than RT_PHASE_VOLTAGE_HIGH_MIN then this fault is raised. Motor Phase Voltage HIGH Test is executed when the Inverter FET is switched on. IF motor phase <n> voltage < PHASE VOLTAGE THRESHOLD HIGH THEN faulty bucket is incremented	M1_PH1_SEN phase voltage high < 3.46V	executed when the Inverter FET is switched on. Motor PWM is on	18 msec/128 counts	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_MOTOR_PHASE_VOLTAGE_1_LOW_FAULT	C0580	This monitor checks if: Bridge FET failure	When phase 1 voltage is low, the microcontroller shall capture {M1_PH1_SEN phase voltage low}, if {M1_PH1_SEN phase voltage low} is greater than RT_PHASE_VOLTAGE_LOW_MAX then this fault is raised Motor Phase Voltage LOW Test is executed when the lower Inverter FET is switched on. IF motor phase <n> voltage > PHASE VOLTAGE THRESHOLD LOW THEN faulty bucket is incremented	M1_PH1_SEN phase voltage low > 0.99V	executed when the lower Inverter FET is switched on. Motor PWM is on	18 msec/128 counts	Type A. MIL Illumination.
MD_MOTOR_PHASE_VOLTAGE_2_HIGH_FAULT	C057F	This monitor checks if: Bridge FET failure	When phase 2 voltage is high, the microcontroller shall capture {M1_PH2_SEN phase voltage high}, if {M1_PH2_SEN phase voltage high} is less than RT_PHASE_VOLTAGE_HIGH_MIN then this fault is raised. Motor Phase Voltage HIGH Test is executed when the Inverter FET is switched on. IF motor phase <n> voltage < PHASE VOLTAGE THRESHOLD HIGH THEN faulty bucket is incremented	M1_PH1_SEN phase voltage high < 3.46V	executed when the Inverter FET is switched on.	18 msec/128 counts	Type A. MIL Illumination.
MD_MOTOR_PHASE_VOLTAGE_2_LOW_FAULT	C0580	This monitor checks if: Bridge FET failure	When phase 2 voltage is low, the microcontroller shall capture {M1_PH2_SEN phase voltage low}, if {M1_PH2_SEN phase voltage low} is greater than RT_PHASE_VOLTAGE_LOW_MAX then this fault is raised. Motor Phase Voltage LOW Test is executed when the lower Inverter FET is switched on. IF motor phase <n> voltage > PHASE VOLTAGE THRESHOLD LOW THEN faulty bucket is incremented	M1_PH1_SEN phase voltage low > 0.99V	executed when the lower Inverter FET is switched on.	18 msec/128 counts	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_MOTOR_PHASE_VOLTAGE_3_HIGH_FAULT	C057F	This monitor checks if: Bridge FET failure	When phase 3 voltage is high, the microcontroller shall capture {M1_PH3_SEN phase voltage high}, if {M1_PH3_SEN phase voltage high} is less than RT_PHASE_VOLTAGE_HIGH_MIN then this fault is raised. Motor Phase Voltage HIGH Test is executed when the Inverter FET is switched on. IF motor phase <n> voltage < PHASE VOLTAGE THRESHOLD HIGH THEN faulty bucket is incremented	M1_PH1_SEN phase voltage high < 3.46V	executed when the Inverter FET is switched on.	18 msec/128 counts	Type A. MIL Illumination.
MD_MOTOR_PHASE_VOLTAGE_3_LOW_FAULT	C0580	This monitor checks if: Bridge FET failure	When phase 3 voltage is low, the microcontroller shall capture {M1_PH3_SEN phase voltage low}, if {M1_PH3_SEN phase voltage low} is greater than RT_PHASE_VOLTAGE_LOW_MAX then this fault is raised. Motor Phase Voltage LOW Test is executed when the lower Inverter FET is switched on. IF motor phase <n> voltage > PHASE VOLTAGE THRESHOLD LOW THEN faulty bucket is incremented	M1_PH1_SEN phase voltage low > 0.99V	executed when the lower Inverter FET is switched on.	18 msec/128 counts	Type A. MIL Illumination.
MD_PU_PHASE_1_STUCK_HIGH_FAULT	C057F	This monitor checks if: • Top FET shorted • Top FET drive stuck on or • Phase sense stuck high	Prior to initialising and enabling the bridge driver a power up test shall be performed to check no top or bottom FET is short circuit Drive stage power up tests confirm that with all FETs off, no phases are driven, Phase voltages checked against expectation, if high raise fault	If the motor phase 1 voltage is near to battery level, before the bridge is activated, probably caused by a short circuit top motor FET, the fault is raised.	Battery/link between 7.1v and 18v	2 counts/2ms	Type A. MIL Illumination.
MD_PU_PHASE_1_STUCK_LOW_FAULT	C0580	This monitor checks if: • Bottom FET shorted • Bottom FET drive stuck on or • Phase sense stuck low	Prior to initialising and enabling the bridge driver a power up test shall be performed to check no top or bottom FET is short circuit Drive stage power up tests confirm that with all FETs off, no phases are driven, Phase voltages checked against expectation, if low raise fault	If the motor phase 1 voltage is near to 0v, before the bridge is activated, probably caused by a short circuit bottom motor FET, the fault is raised.	Battery/link between 7.1v and 18v	2 counts/2ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_PU_PHASE_2_STUCK_HIGH_FAULT	C057F	This monitor checks if: • Top FET shorted • Top FET drive stuck on or • Phase sense stuck high	Prior to initialising and enabling the bridge driver a power up test shall be performed to check no top or bottom FET is short circuit Drive stage power up tests confirm that with all FETs off, no phases are driven, Phase voltages checked against expectation, if high raise fault	If the motor phase 1 voltage is near to battery level, before the bridge is activated, probably caused by a short circuit top motor FET, the fault is raised.	Battery/link between 7.1v and 18v	2 counts/2ms	Type A. MIL Illumination.
MD_PU_PHASE_2_STUCK_LOW_FAULT	C0580	This monitor checks if: • Bottom FET shorted • Bottom FET drive stuck on or • Phase sense stuck low	Prior to initialising and enabling the bridge driver a power up test shall be performed to check no top or bottom FET is short circuit Drive stage power up tests confirm that with all FETs off, no phases are driven, Phase voltages checked against expectation, if low raise fault	If the motor phase 2 voltage is near to 0v, before the bridge is activated, probably caused by a short circuit bottom motor FET, the fault is raised.	Battery/link between 7.1v and 18v	2 counts/2ms	Type A. MIL Illumination.
MD_PU_PHASE_3_STUCK_HIGH_FAULT	C057F	This monitor checks if: • Top FET shorted • Top FET drive stuck on or • Phase sense stuck high	Prior to initialising and enabling the bridge driver a power up test shall be performed to check no top or bottom FET is short circuit Drive stage power up tests confirm that with all FETs off, no phases are driven, Phase voltages checked against expectation, if high raise fault	If the motor phase 1 voltage is near to battery level, before the bridge is activated, probably caused by a short circuit top motor FET, the fault is raised.	Battery/link between 7.1v and 18v	2 counts/2ms	Type A. MIL Illumination.
MD_PU_PHASE_3_STUCK_LOW_FAULT	C0580	This monitor checks if: • Bottom FET shorted • Bottom FET drive stuck on or • Phase sense stuck low	Prior to initialising and enabling the bridge driver a power up test shall be performed to check no top or bottom FET is short circuit Drive stage power up tests confirm that with all FETs off, no phases are driven, Phase voltages checked against expectation, if low raise fault	If the motor phase 3 voltage is near to 0v, before the bridge is activated, probably caused by a short circuit bottom motor FET, the fault is raised.	Battery/link between 7.1v and 18v	2 counts/2ms	Type A. MIL Illumination.
MD_PU_BRIDGE_BH1_UV_FAULT	C0580	This monitor checks if: • ECU hardware failure	Bridge driver boostrap high side 1 capacitor under voltage fault reported during Bridge driver configuration.	With bridge enabled and SOFF off, the FET IL1 is driven for 200us. After 200us, "high side buffer capacitor 1 under voltage" error in internal error register is still set.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1ms	Type A. MIL Illumination.
MD_PU_BRIDGE_ERR_STUCK_HI_FAULT	C0582	This monitor checks if: • Bridge Driver ERR line connectivity • Bridge driver incorrect operation.	Verify Error line goes active (low), when error condition is injected.	During self test, the Bridge Driver HW error output pin (IOHWAB_BRIDGE_1_ERROR) was not active, when Current Sense Amplifier 1&2 - Gain 2 was set to a invalid value	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_PU_BRIDGE_ERR_ STUCK_LO_FAULT	C0582	This monitor checks if: • Bridge Driver ERR signal connectivity.	Verify Error line goes inactive (high), when injected error condition is removed.	When Bridge configuration is started by driving the HW output Pin (IOHWAB_BRIDGE_1_INHIBIT) inactive, the HW Input Pin (IOHWAB_BRIDGE_1_ERROR) stays active.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.
MD_PU_BRIDGE_INIT_ TIMEOUT_FAULT	C0582	This monitor checks if: • Micro controller SPI failure. • Bridge Driver failure.	Verify Bridge Driver initialization completed within SPUT_DRV_INIT_MAX_TIME.	If initialization of the bridge driver does not occur within 100ms @ 1ms /bit	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1ms	Type A. MIL Illumination.
MD_PU_BRIDGE_MAX_ POWER_DOWN_FAULT	C0582	This monitor checks if: • Incorrect Bridge Driver operation	Allow only BD_PU_MAX_POWER_DOWN_CYC LES of retry, during Bridge Driver power up sequence.	the number of power down cycles during a bridge driver power up sequence exceeds 3	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1ms	Type A. MIL Illumination.
MD_PU_BRIDGE_OC_TI MEOUT_FAULT	C0582	This monitor checks if: • Incorrect Bridge Driver operation	Verify intermediate over current tests are completed within SPUT_DRV_OVER_CURRENT_MAX _TIME.	Immediate overcurrent tests are not completed within 10ms @ 0.1us/bit	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.
MD_PU_BRIDGE_OCT_ NOT_COMPLETED	C0582	This monitor checks if: • Incorrect Bridge Driver operation	Verify over current test is completed within SPUT_DRV_OCT_MAX_EXECUTION _TIME.	overcurrent tests are not completed within 50ms @ 0.1us/bit	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.
MD_PU_BRIDGE_UNAC CEPTABLE_ERR	C0582	This monitor checks if: • Incorrect Bridge Driver operation	Verify no un-acceptable errors are reported by Bridge device during power up.	If the below unacceptable error bits are set. - Global test mode (gtm) - Overvoltage Internal Regulator 6 Error (err_ov_reg6) - Charge Pump 1 Overload Error(err_cp1) - Charge Pump 2 Overload Error (err_cp2) - Overtemperature Shutdown (sd_ot) - Charge PumpOvervoltage Shutdown at Pin CB or Pin CH2-CL2 (sd_ov_cp), - Vs Path Charge Pump Input Overload (sd_cp1), - Overtemperature Detection (err_ot_w) - Latent Fault Warning (lfw) - Error Correction of Control Register Failed(ctrl_reg_invalid), - err_ov_ld_vdh in External Errors.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 counts/3ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_PU_ISENSE_ZERO_OFFSET_FAULT	C0596	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	Zero I sense outside valid range The microcontroller shall test that while M1_ITP (positive) offset is inactive and M1_ITN (negative) offset is inactive, M1_ISENSE_1 (zero I-sense offset) is within SPUT_ISENSE1_OFFSET_MAX_ERROR	zero Isense offset (M1_ISENSE_1) is outside the normal range	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1ms	Type A. MIL Illumination.
MD_PU_MCU_FET_OP_STUCK_ON_FAULT	C0582	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	While bridge driver is enabled and prior to driving top or bottom FETs a power up test shall be performed to check no top or bottom FET is stuck on Turn all FETs off (MCU outputs off, bridge should drive FETs off) Monitor phase voltage whether is high/low	Top and Bottom FET stuck on during a Power up test. (Phase voltage is high when FETs are turned OFF)	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.
MD_PU_BRIDGE_CONFIGSTATE_CHG_FAULT	C0594	This monitor checks if: • Micro controller SPI failure. • Bridge Driver failure.	This failsafe guarantees that the bridge driver is in an acceptable mode (Normal, Safe Off, Config, or Error) during the power-up test sequence. Unknown, Idle, Config Lock, Self Test, Rectification, and Sleep modes will cause this fault to latch.	Bridge Driver remains in "Idle Mode" for 5ms in which it was expected that it transits to "Configuration Mode", after the configuraion has been sent via SPI.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 msec	Type A. MIL Illumination.
MD_PU_BRIDGE_OVER_CURRENT_FAULT	C0590	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	This failsafe tests that over current detection on the bridge driver is working as it should. This failsafe operates during the power-up test.	Self test was started and Current Sense Amplifier 1&2 - Gain 2 was set to a invalid value and bridge driver error output pin (IOHWAB_BRIDGE_1_ERROR) was active, but over current fault bit was not set in sBridgeDriver.CurrentSenseAmpErrorStatus. OR Self test was startedandCurrent Sense Amplifier 1&2 - Gain 2 was set to a valid value and bridge driver error output pin (IOHWAB_BRIDGE_1_ERROR) was inactive, but over current fault bit was set in sBridgeDriver.CurrentSenseAmpErrorStatus.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_MOTOR_OPEN_PHASE1_FAULT	C0580	This monitor checks if: • Open Phase	d-axis and q-axis demand is compared with phase 1 measured current, if difference is less than threshold and if actual current is less then threshold, raise a fault	Low Speed Detection (0rpm..400rpm): average D-axis current errors (over last 12 samples in 200μs cycle) > 6A (ID_OPEN_PHASE_ERR_THRESHOLD) AND maximum of phase current amplitude > 10A (PHASE_CURRENT_DIAG_ENABLE)AND last 3 samples A1 or C1 < 0.5A (ZERO CURRENT SAMPLE THRESHOLD) AND motor phase 1 current < 1A (ZERO_PHASE_CURRENT_THRESHOLD)	• NOT in Motor Open Phase Back-Up Mode AND • motor mechanical speed < 2400 rpm (MAX_MECH_SPD_OPEN_PHASE_DIAG_EN) AND • ECU assist enabled	4 counts/4ms	Type A. MIL Illumination.
				High Speed Detection (400rpm..2400rpm): last 4 samples of Q-axis current demand > 10A (CURR DEM THRESHOLD) AND motor phase 1 current < 1A (ZERO_PHASE_CURRENT_THRESHOLD)			
MD_MOTOR_OPEN_PHASE2_FAULT	C0580	This monitor checks if: • Open Phase	d-axis and q-axis demand is compared with phase 2 measured current, if difference is less than threshold and if actual current is less then threshold, raise a fault	Low Speed Detection (0rpm..400rpm): average D-axis current errors (over last 12 samples in 200μs cycle) > 6A (ID_OPEN_PHASE_ERR_THRESHOLD) AND maximum of phase current amplitude > 10A (PHASE_CURRENT_DIAG_ENABLE)AND last 3 samples A1 or C1 < 0.5A (ZERO CURRENT SAMPLE THRESHOLD) AND motor phase 2 current < 1A (ZERO_PHASE_CURRENT_THRESHOLD)	• NOT in Motor Open Phase Back-Up Mode AND • motor mechanical speed < 2400 rpm (MAX_MECH_SPD_OPEN_PHASE_DIAG_EN) AND • ECU assist enabled	4 counts/4ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
				High Speed Detection (400rpm..2400rpm): last 4 samples of Q-axis current demand > 10A (CURR DEM THRESHOLD) AND motor phase 1 current < 1A (ZERO_PHASE_CURRENT_THRESHOLD)			
MD_MOTOR_OPEN_PHASE3_FAULT	C0580	This monitor checks if: • Open Phase	d-axis and q-axis demand is compared with phase 3 measured current, if difference is less than threshold and if actual current is less then threshold, raise a fault	Low Speed Detection (0rpm..400rpm): average D-axis current errors (over last 12 samples in 200µs cycle) > 6A (ID_OPEN_PHASE_ERR_THRESHOLD) AND maximum of phase current amplitude > 10A (PHASE_CURRENT_DIAG_ENABLE)AND last 3 samples A1 or C1 < 0.5A (ZERO CURRENT SAMPLE THRESHOLD) AND motor phase 3 current < 1A (ZERO_PHASE_CURRENT_THRESHOLD)	• NOT in Motor Open Phase Back-Up Mode AND • motor mechanical speed < 2400 rpm (MAX_MECH_SPD_OPEN_PHASE_DIAG_EN) AND • ECU assist enabled	4 counts/4ms	Type A. MIL Illumination.
				High Speed Detection (400rpm..2400rpm): last 4 samples of Q-axis current demand > 10A (CURR DEM THRESHOLD) AND motor phase 1 current < 1A (ZERO_PHASE_CURRENT_THRESHOLD)			
MD_MOTOR_I_SENSE_DYNAMIC_COMM_MODE_FAULT	C0582	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	If ({common mode I-sense offset} – {zero I-sense offset}) is outside RT_ISENSE1_MAX_CM_ISHIFT_RANGE then this fault is raised. reference value is taken before applying both voltage offsets (Common), diagnostic_sample point is measured, if diagnostic_sample > reference +/- threshold then raise a fault	Either current sample is outside a valid range set by the respective reference sample plus /minus [-35A (DM_ISenseRtMaxCmIShiftNeg)...+35A (DM_ISenseRtMaxCmIShiftPos)]	• ECU assist enabled AND • ECU is not initializing or shutting down	4count/16ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_MOTOR_I_SENSE_DYNAMIC_POSITIVE_FAULT	C0582	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	If {M1_ISENSE1 positive offset current} is outside expected limits then this fault is raised. reference value is taken before applying positive voltage offset (P), diagnostic_sample point is measured, if reference is not saturated and if diagnostic_sample < reference + threshold then raise a fault	the absolute current sample during test is lower than the induced offset	• ECU assist enabled AND • ECU is not initializing or shutting down	4count/16ms	Type A. MIL Illumination.
MD_MOTOR_I_SENSE_DYNAMIC_NEGATIVE_FAULT	C0582	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	If {M1_ISENSE1 negative offset current} is outside expected limits then this fault is raised. reference value is taken before applying negative voltage offset (N), diagnostic_sample point is measured, if reference is not saturated and if diagnostic_sample > reference + threshold then raise a fault	the absolute current sample during test is lower than the induced offset	• ECU assist enabled AND • ECU is not initializing or shutting down	4count/16ms	Type A. MIL Illumination.
MD_MOTOR_POSITION_SENSOR_FAULT	C058A	This monitor checks if: • Safety mechanism is able to detect absolute Hall-effect signal stuck/ stuck low by detecting invalid states	Motor electrical absolute position is determined from three Hall-effect sensors. There are two invalid states: all 0 and all 1. Safety mechanism is able to detect Hall-effect signal stuck high or stuck low by detecting invalid states before erroneous electrical angle is more than 60 deg.	All 3 hall sensors are either all high (state 7=111bin) or all low (state 0)	• ECU is not shutting down.	1 msec (20 consecutive 50 usec observations)	Type A. MIL Illumination.
MD_MOTOR_POSITION_MISSING_CALIB_FAULT	P0602	This monitor checks if: • Malfunctioning MPS • Unpowered MPS	The ED subsystem aggregates possible failure cases of the MPS1 SPI signal into a single DTC.	ED subsystem reports failure of MPS1 signal	• ECU is not shutting down.	1 msec (20 consecutive 50 usec observations)	Type A. MIL Illumination.
MD_MOTOR_POSITION_SENSOR_EEPROM_FAULT	C0596	This monitor checks if: • Malfunctioning MPS • Unpowered MPS	· SPI error bits set during communication with EEPROM on MPS sensor, or incorrect data fingerprint found in EEPROM data read from sensor	o QSPI0_STATUS bit 3 or bit 6 are set during communication with EEPROM o EEPROM identification page[0] != 0x20 || EEPROM identification page[1] != 0x00 || EEPROM identification page[2] != 0x09	N/A	1 count	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_ISENSE_CROSS_CHECK_FAULT	C0582	This monitor checks if: • Current Sense Circuitry	The microcontroller shall capture M1_ISENSE1 and M1_ISENSE2 current samples, if average difference between M1_ISENSE1 and M1_ISENSE2 over five samples is greater than RT_ISENSE_CROSS_CHECK_LIMIT, then this fault is raised and assist removed reads two independent ADC by 5 samples and averages it to measure current flow and compares, if difference is more than allowed,	The sum of the error between phase current samples (internal and external amplifier) is not in the range [-47A (MIN_ISENSE_DIFFERENCE) ...+47A (MAX_ISENSE_DIFFERENCE)] OR no new data from current sensors received	• ECU assist enabled AND • ECU is not initializing or shutting down	20 counts/80ms	Type A. MIL Illumination.
MD_IEM_SEQUENCE_ERROR_FAULT	C0595	This monitor checks if: • Interrupt failure	Motor Control tasks are deemed to not be executing in the correct order. For every configured interrupt, read out any complete sequences that are in the log. For each sequence read out, the CRC is calculated for the observation points, and is compared against the expected value for that interrupt/mode. Mode is determined from the first observation point in the sequence. A fault is raised when there is a mismatch and the CRC check is stopped for that interrupt.	Whenever a motor interrupt is entered and exited, everytime it writes a unique number into a rolling buffer. The diagnostic calculates the CRC over complete interrupt sequences (depending on the motor state) in the buffer and raises a fault if there is a mismatch.	• ECU is not shutting down	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_CLOCK_FAIL_FAULT	C0595	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	During run time Bridge Driver reports internal clock failure (using ERR line and SPI error registers).	• bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND • In register shutdown error "Internal Clock Supervision Shutdown" is set.	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_CONFIG_COMP_FAULT	C0595	This monitor checks if: • Bridge Driver incorrect operation.	To ensure correct configuraiton data is written into Bridge Driver IC. Configuration failure detection is required in order to mitigate: - Micro controller SPI failure. - Bridge Driver failure..	During initialization, if Bridge Driver state changes to CONFIG_LOCK, report config invalid fault.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 counts/3ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_CONFIG_ERROR_FAULT	C0595	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	During run time Bridge Driver reports config error (using ERR line and SPI error registers).	• bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) AND • SPI status "config valid" bit is not set AND • the fault has occurred more than once in this ignition cycle.	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_CONFIG_INVALID_FAULT	C0595	This monitor checks if: • Incorrect CRC transmitted during initialisation. • Micro controller SPI failure. • Bridge Driver failure.	During initialisation, if Bridge Driver state changes to CONFIG_LOCK, report config invalid fault.	Bridge Driver has entered the "Configuration Lock Mode" during configuration.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 msec	Type A. MIL Illumination.
MD_BRIDGE_CONFIG_STALLED_FAULT	C0595	This monitor checks if: • Micro controller SPI failure. • Bridge Driver failure.	Verify configuration check is completed within BRIDGE_DRV_CFG_STALLED_TIMEOUT.	Bridge Driver configuration data check was not completed within 20ms.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 counts/3ms	Type A. MIL Illumination.
MD_BRIDGE_CB_UNDER_VOLTAGE_FAULT	C0580	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	During run time, the Bridge Driver reports charge pump buffer under voltage error on the CB pin of the Bridge driver ASIC (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND (In register shutdown error "CB undervoltage shutdown" is set AND In register internal error "CB undervoltage detection error" is set).	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_CF_BRIDGE_CONFIG_FAULT	C0595	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	During run time Bridge Driver reports error (using ERR line and SPI error registers).	• bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) AND • SPI status "config valid" bit is not set AND • the fault has occurred more than once in this ignition cycle.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_CF_BRIDGE_ECC_FAULT	C0595	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	During run time Bridge Driver reports error (using ERR line and SPI error registers).	special event register of bridge driver indicates that error correction of control register failed AND the fault has occurred more than once in this ignition cycle.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_CF_REG1_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bad Motor Driver Circuit • Bad motor driver ASIC • Bad motor	During run time Bridge Driver reports error (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register internal errors "overvoltage internal regulator 1 error" is set AND the fault has occurred only once in this ignition cycle.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_REFERENCE_VOLTAGE_FAULT	C0580	This monitor checks if: • Micro controller • Bridge Driver amplifier reference voltage ADC failure.	Verify Bridge Driver reference voltage is within limits.	HW Pin for reference voltage (IOHWAB_BRIDGE_1_REF_VOLTAGE) is not between 2.25V and 2.75V.	• ECU provides assist AND • No safe state on bridge driver	18ms/128 counts	Type A. MIL Illumination.
MD_BRIDGE_3V3_UNDER_VOLTAGE_FAULT	C0580	This monitor checks if: • Bridge Driver incorrect operation.	Monitor Bridge Driver reporting under voltage error on its VCC (V3V3) pin.	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_3V3_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation.	Bridge Driver is reporting over voltage on its VCC (V3V3) pin.	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register external errors "VCC Undervoltage Detection Error" is set.	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_ERR_STUCK_LO_FAULT	C0582	This monitor checks if: • Bridge Driver ERR line connectivity • Bridge driver incorrect operation.	Check M1_BD_ERR line state.	During self test, the bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR), when Current Sense Amplifier 1&2 - Gain 2 (=BD_REG_OP_GAI_2) was set to a valid value.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 msec	Type A. MIL Illumination.
MD_BRIDGE_VS_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation • Battery Voltage	During run time Bridge Driver reports VS over voltage error (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND (In register shutdown error "Vs Overvoltage Shutdown" is set OR In register external error "Vs Overvoltage Detection Error" is set).	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_VS_UNDER_VOLTAGE_A_FAULT	C0580	This monitor checks if: • Low battery voltage	Bridge driver will detect undervoltage condition. The software shall interrogate the Bridge Driver to determine whether the fault is valid and if valid raises the fault.	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register external errors "Vs Undervoltage Detection Error" is set.	• ECU provides assist AND • No safe state on bridge driver	18ms/128 counts	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_VS_UNDER_VOLTAGE_B_FAULT	C0580	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports VS under voltage error (using ERR line and SPI error registers), but battery voltage is greater than BD_VSU_UV_DETECT_THRESHOLD.	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register external errors "VS Undervoltage Detection Error" is set AND battery voltage is >= 6.5V.	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_VDHP_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation • Battery Voltage	During run time Bridge Driver reports VDHP over voltage error (using ERR line and SPI error registers).	• The voltage on the VS pin of the bridge driver ASIC is above 39.95V • Bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND (In register shutdown error "VDHP Overvoltage Shutdown" is set AND In register external error "VDHP Overvoltage Detection Error" is set).	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_VDHP_UV_A_FAULT	C0580	This monitor checks if: • Excessive local temperature OR failures that cause incorrect detection of over temperature.	Data read from Bridge Driver over SPI indicates an undervoltage on the VDHP pin of the Bridge Driver ASIC.	• The voltage on the VS pin of the bridge driver ASIC is below 3.96V • Bridge driver error output pin is active IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register External errors "VDHP Undervoltage Detection Error" is set	• ECU provides assist AND • No safe state on bridge driver	18msec/128 counts	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_VDHP_UV_B_FAULT	C0580	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports VDHP under voltage error (using ERR line and SPI error registers), but battery voltage is greater than BD_VDHU_UV_DETECT_THRESHOLD.	• The voltage on the VS pin of the bridge driver ASIC is below 3.96V • Bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register External errors "VDHP Undervoltage Detection Error" is set AND battery voltage is > 6.5V.	• ECU provides assist AND • No safe state on bridge driver	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_UNDEFINED_ERROR_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	During run time SPI error status flag OR Bridge ERR line is active, but no faults are reported in SPI error registers.	Bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set	• ECU provides assist AND • No safe state on bridge driver	1 count/1 ms	Type A. MIL Illumination.
MD_BRIDGE_UNEXPECTED_MODE_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	Bridge Driver reports unexpected state.	Below conditions are not satisfied. ((sBridgeDriver.ICMode == BRDG_NORMAL_OPERATION) || (sBridgeDriver.State == BD_SHUTDOWN) || ((sBridgeDriver.ICMode == BRDG_ERROR_MODE) && (IOHWAB_BRIDGE_1_ERROR == ACTIVE)))	• ECU provides assist AND • No safe state on bridge driver	16 counts/ 16ms	Type A. MIL Illumination.
MD_BRIDGE_UNEXPECTED_STATE_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	Verify Bridge driver state is as expected during initialisation.	Bridge driver mode is not at the expected state during configuration.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 counts / 3 ms	Type A. MIL Illumination.
MD_BRIDGE_SOFF_STUCK_LO_FAULT	C0582	This monitor checks if: • M1_BD_SOFF signal not working correctly.	Check bridge driver status is reported as "normal" mode" when M1_BD_SOFF is inactive.	When bridge test pin (IOHWAB_BRIDGE_1_TEST) is driven active, bridge driver state (sBridgeDriver.State) did not change to BD_NORMAL.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts /2ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_SPI_MSG_FAILED_FAULT	C0595	This monitor checks if: • Bridge Driver incorrect operation • Microcontroller SPI failure.	Bridge Driver reports SPI errors (using SPI error registers) OR received SPI message CRC is invalid.	("SPI error flag" is set in SPI status AND Either “Invalid Address Access”, “SPI Time-out”, “SPI Frame error”, “SPI Time-out”, “SPI CRC error” is set in SPI communication and configuration error register) OR Invalid SPI response is received.	Ignition State = ON OR Wake ON CAN	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_SPI_RESP_TIMEOUT_FAULT	C0595	This monitor checks if: • Incorrect low level SPI driver operation.	Verify Bridge Driver low level SPI communication is working.	Low level SPI driver is not responding.	(Ignition State = ON OR Wake ON CAN AND Battery Voltage > 6V AND Bridge Driver is not reporting under voltage	1 count/1 ms	Type A. MIL Illumination.
MD_BRIDGE_REG_UNDER_VOLTAGE_FAULT	C0580	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports internal regulator under voltage error (using ERR line and SPI error registers), but battery voltage is greater than BD_IRU_UV_DETECT_THRESHOLD.	• Bridge Driver internal regulator voltage < 6.5V @1/256V/bit • Bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register internal error "Undervoltage Internal Regulator 4 or 5 or 6 Error" is set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1 ms	Type A. MIL Illumination.
MD_BRIDGE_REG1_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports Internal regulator over voltage error (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register internal errors "overvoltage internal regulator 1 error" is set AND the fault has occurred only once in this ignition cycle.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_REG6_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports Internal regulator over voltage error (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register internal errors "overvoltage internal regulator 6 error" is set	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1 ms	Type A. MIL Illumination.
MD_BRIDGE_RECONFIGURED_EVENT	C0582	This monitor checks if: • Faults detected which require reconfiguration of Bridge driver.	To indicate when Bridge driver reconfiguration was performed.	Bridge Driver reconfiguration was requested.	EcuC.rootState_active == EcuC_MotorDriveOn AND DrvStg.SafeStateRequired == FALSE AND Battery Voltage > 6V AND Bridge Driver is not reporting under voltage	1 count/1 ms	Type A. MIL Illumination.
MD_BRIDGE_OVER_CURRENT_FAULT	C0590	This monitor checks if: • Bridge Driver incorrect operation.	Bridge Driver reporting amplifier over current errors.	IOHWAB_BRIDGE_1_ERROR is active OR in SPI status "error flag" is set AND In register current sense amplifier errors "err_oc_op1 or err_oc_op2 or err_oc_op3" are set.	EcuC.rootState_active == EcuC_MotorDriveOn AND DrvStg.SafeStateRequired == FALSE AND Battery Voltage > 6V AND Bridge Driver is not reporting under voltage	1 count/1 ms	Type A. MIL Illumination.
MD_BRIDGE_OVER_TEMP_ERROR_FAULT	C05C2	This monitor checks if: • Excessive local temperature OR failures that cause incorrect detection of over temperature.	During run time Bridge Driver reports over temperature error (using SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register shutdown error "Overtemperature Shutdown" is set.	• ECU provides assist AND • No safe state on bridge driver	1 count/1 ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_OSF_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports output stage feedback failure (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register for output stage feedback errors any error is set	• ECU provides assist AND • No safe state on bridge driver	1 count /1ms	Type A. MIL Illumination.
MD_BRIDGE_ECC_FAIL_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports ECC failure (using SPI error registers).	special event register of bridge driver indicates that error correction of control register failed AND the fault has occurred more than once in this ignition cycle.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_HS_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports high side capacitor over voltage error (using ERR line and SPI error registers).	• Bridge Driver highside capacitor voltage < 6.5V @1/256V/bit • bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register internal error "High-side Buffer Capacitor 1 or 2 or 3 Overvoltage Detection Error" is set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_HS_UNDER_VOLTAGE_FAULT	C0580	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports high side capacitor under voltage error (using ERR line and SPI error registers), but battery voltage is greater than BD_HBCU_UV_DETECT_THRESHOLD.	• Bridge Driver highside capacitor voltage < 6.5V @1/256V/bit • bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register internal error "High-side Buffer Capacitor 1 or 2 or 3 Undervoltage Detection Error" is set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_NOT_DISABLED_FAULT	C0582	This monitor checks if: • Bridge Driver enable signal connectivity.	The microprocessor shall test that when M1_BD_ENA (bridge driver enable) is inactive, motor FETs can not be driven.	Set bridge driver HW enable Pin (IOHWAB_BRIDGE_1_ENABLE) inactive and set all three bottom FETs ON. After 100us all bottom FETS were not disabled.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts /2ms	Type A. MIL Illumination.
MD_BRIDGE_SOFF_NOT_DISABLED_FAULT	C0582	This monitor checks if: • Bridge Driver SOFF signal connectivity.	The microprocessor shall test that when SOFF pin is inactive, motor FETs can not be driven.	Set bridge driver HW SOFF Pin inactive and set all three bottom FETs ON. After 100us all bottom FETS were not disabled.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts /2ms	Type A. MIL Illumination.
MD_BRIDGE_LATENT_WARNING_EVENT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	The BD has reported a 'latent fault' (over SPI)	In SPI status "SPI special event" is set AND In special events register "SPI Latent Fault Warning" is set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_NOT_ENABLED_FAULT	C0582	This monitor checks if: • Bridge Driver enable signal connectivity.	The microprocessor shall test that when M1_BD_ENA (bridge driver enable) is active motor FETs can be driven.	Set bridge driver HW enable Pin (IOHWAB_BRIDGE_1_ENABLE) active with all three bottom FETS already ON. After 100us even one bottom FET was not enabled.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.
MD_BRIDGE_SOFF_NOT_ENABLED_FAULT	C0582	This monitor checks if: • Bridge Driver SOFF signal connectivity.	The microprocessor shall test that whenSOFF pin is active motor FETs can be driven.	Set bridge driver HW SOFF Pin active with all three bottom FETS already ON. After 100us even one bottom FET was not enabled.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/2ms	Type A. MIL Illumination.
MD_BRIDGE_CP_OVER_VOLTAGE_FAULT	C057F	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports charge pump over voltage error (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register external error "charge pump overvoltage detection error" is set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_CP1_OVERLOAD_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports CP1 overload error (using ERR line and SPI error registers).	special event register of bridge driver indicates that error correction of control register failed AND (In register internal errors "Charge Pump 1 Overload Error" is set OR In register shutdown errors "Vs Path Charge Pump Input Overload" is set).	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_CP2_OVERLOAD_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports CP2 overload error (using ERR line and SPI error registers).	special event register of bridge driver indicates that error correction of control register failed AND (In register internal errors "Charge Pump 2 Overload Error" is set	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_DDP_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	During run time Bridge Driver reports digital driving path failure (using ERR line and SPI error registers).	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register shutdown error "Digital Driving Path Stucked Shutdown" is set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_DRV_BIST_CB_UV_FAULT	C0580	This monitor checks if: • Bridge Driver incorrect operation.	Perform Bridge driver charge pump buffer (CB) under voltage self test.	When Bridge Driver was put into CB under voltage self test mode and after 5msec, bridge driver error output pin was not active (IOHWAB_BRIDGE_1_ERROR)	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 count/50ms	Type A. MIL Illumination.
MD_BRIDGE_DRV_BIST_CSA_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	Perform Bridge driver amplifier gain BIST.	When Bridge Driver was put into CSA Gain self test mode, bridge driver error output pin is not active (IOHWAB_BRIDGE_1_ERROR) OR Isense reading was not within limits.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/50ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_DRV_BIST_CSA_VRO_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	Perform Bridge driver CSA VRO BIST.	When Bridge Driver was put into CSA VRO self test and self test was finished, one of the CSA 1/2/3 supply over voltage/under voltage error bit was not set.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/50ms	Type A. MIL Illumination.
MD_BRIDGE_DRV_BIST_SHORT_CCT_FAULT	C0582	This monitor checks if: • Bridge Driver short circuit detection not working.	Bridge driver built in high/low side short circuit detection test.	When Bridge Driver was put into short circuit test mode and FET was driven, bridge driver error output pin was not active (IOHWAB_BRIDGE_1_ERROR) OR Short circuit error bits were not set in register OR High-side 1/2/3 Drain Source Measurement were not at expected value.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	3 counts/75ms	Type A. MIL Illumination.
MD_BRIDGE_DRV_BIST_TIMEOUT_FAULT	C0582	This monitor checks if: • Bridge Driver BIST not working correctly.	Built-in selftest timeout.	Bridge Driver built in self test was not completed within 100msec.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	1 count/1ms	Type A. MIL Illumination.
MD_BRIDGE_DRV_BIST_VCC_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	Perform Bridge Driver's VCC built in self test.	When Bridge Driver was put into VCC self test mode, bridge driver error output pin was not active (IOHWAB_BRIDGE_1_ERROR) OR VCC under voltage error bit was not set in external error register	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 counts/50ms	Type A. MIL Illumination.
MD_BRIDGE_DRV_INHIBIT_FAULT	C0582	This monitor checks if: • Bridge Driver inhibit signal connectivity • Bridge Driver incorrect operation.	Verify Bridge Driver will be in SLEEP mode, if Bridge driver is inhibited.	When HW inhibit Pin (IOHWAB_BRIDGE_1_INHIBIT) is active, the bridge driver operation mode register did not indicate that it is in the expected Sleep Mode.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2counts/2ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MD_BRIDGE_DRV_WAKE_UP_FAULT	C0582	This monitor checks if: • Bridge Driver inhibit signal connectivity • Bridge Driver incorrect operation.	Remove Bridge inhibit and verify SPI comms is started and Bridge Driver state changes to IDLE.	When HW inhibit Pin (IOHWAB_BRIDGE_1_INHIBIT) is driven inactive, the bridge driver operation mode register did not transit from Sleed Mode to the expected Idle Mode.	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2counts/2ms	Type A. MIL Illumination.
MD_BRIDGE_SHORT_CIRCUIT_FAULT	C0582	This monitor checks if: • Bridge Driver incorrect operation.	This failsafe checks the SPI communication from the bridge driver to see if it is reporting a short circuit fault. This failsafe operates at run-time	bridge driver error output pin is active (IOHWAB_BRIDGE_1_ERROR) OR the SPI status "error flag" is set AND In register Short Circuit Errors any of the "Short Circuit at High/Low-side 1 or 2 or 3" are set.	• ECU provides assist AND • No safe state on bridge driver Note: ECU provides assist includes that the measured battery voltage is above 6V and that there is no undervoltage reported from the bridge driver internal voltage monitoring.	3 msec	Type A. MIL Illumination.
MOTOR_OVER_TEMP_FAIL	C05C2	This monitor checks if: Motor over temperature.	Motor temperature is greater than threshold.	Electric Drive Temperature > 154°	Power ON, Continuous Failsafing	20 msec	Type A. MIL Illumination.
MD_PU_BRIDGE_PIR_CLOSE1_LSD_FAULT	C0580	This monitor checks if: o Bridge driver disabled o Bridge driver in safe off mode o Bridge driver malfunctioning	· Driven phase is detected as not low when it should be driven low.	· Driven phase voltage > 1.2V when < 1.2V expected	Battery voltage between 7.1v and 18v AND Motor rotating below +/-8.3mrev/s	2 msec	Type A. MIL Illumination.
MD_PU_BRIDGE_PIR_CLOSE1_OPEN_CCT_FAULT	C0580	This monitor checks if: o Open motor phase	Non-driven phase voltages not pulled low while FETs are driven closed.	· phase voltage > 1.2V when < 1.2V expected	· If MD_PU_BRIDGE_PIR_CLOSE1_LSD_FAULT detects, this fault will not detect.	2 msec	Type A. MIL Illumination.
Group 10 - Ground Monitor							
GROUND_1_DISCONNECTED	U3008	This monitor checks if: • Disconnected Ground	The GND_1 and GND_2 connections are independent wire connections to vehicle ground. A loss of either individual circuit detectable. Normally each wire should carry 50% of the total current load. The ground loss detection circuit feedbacks are compared to determine the actual current ratio using the formula in fault equation. Gnd_1_voltage is based on Gnd_1_Fdbk_A Gnd_2_voltage is based on Gnd_2_Fdbk_B If the resulting value is above 0.9 then a missing a missing ground is indicated and GND_1 disconnected fault is set.	Voltageactual= (Gnd1voltage - Gnd2voltage /Gnd1voltage+Gnd2voltage)	• Polaris is initialized. • No faulty ADCs detected.	200ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
GROUND_2_DISCONNECTED	U3009	This monitor checks if: • Disconnected Ground	The GND_1 and GND_2 connections are independent wire connections to vehicle ground. A loss of either individual circuit detectable. Normally each wire should carry 50% of the total current load. The ground loss detection circuit feedbacks are compared to determine the actual current ratio using the formula in fault equation. Gnd_1_voltage is based on Gnd_1_Fdbk_A Gnd_2_voltage is based on Gnd_2_Fdbk_B If resulting value is below -0.9,GND_2 disconnected fault is set	Voltageactual= (Gnd1voltage - Gnd2voltage /Gnd1voltage+Gnd2voltage)	• Polaris is initialized. • No faulty ADCs detected.	200ms	Type A. MIL Illumination.
Group 11 - Switches							
BASE_BRAKE_FAILURE	C0049	This monitor checks if: • Anything that causes the fluid level feedback to indicate low fluid level. • Master cylinder loss of fluid on a hydraulic circuit • Fluid leaks • Wiring	• The Brake Fluid Level switch is a hardwired input to the EBCM. Whenever the voltage level is below the threshold, the failure timer will be triggered.	Brake Fluid Level feedback voltage < 15% of battery voltage	• Power ON, Continuous Failsafing	8 s	Type C, No MIL, "Emissions Neutral Diagnostic "
Group 12 - Pressure Sensor							
SCP1_CORRELATION_ERROR	C0574	This monitor checks if: SCP1 signal failure	The SCP1,SCP2 and PTS sensor signals are used to compare and identify a single failed sensor signal. This fault is set if the difference exceeds the error threshold value.	|SCP_1 - SCP_2| > 5 Bar	Input signals valid for some time (allow system/signal to initialize)	100 ms Goal: 18000	Type A. MIL Illumination.
SCP2_CORRELATION_ERROR	C0574	This monitor checks if: SCP2 signal failure	The SCP1,SCP2 and PTS sensor signals are used to compare and identify a single failed sensor signal. This fault is set if the difference exceeds the error threshold value.	|SCP_1 - SCP_2| > 5 Bar	Input signals valid for some time (allow system/signal to initialize)	100 ms Goal: 18000	Type A. MIL Illumination.
SCP1_OFFSET_ERROR	C0574	This monitor checks if: SCP1 signal failure	The offset required to zero the Secondary circuit pressure sensor is larger than the specification limit.	|SCP_1_Off| > 10 Bar	The fault itself does not have much enable condition. Whenever an offset is learned, it is checked for result. To allow the learning, vehicle faster than some speed, vehicle accelerating, driver not on brake,	100 ms Goal: 18000	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SCP2_OFFSET_ERROR	C0574	This monitor checks if: SCP2 signal failure	The offset required to zero the Secondary circuit pressure sensor is larger than the specification limit.	|SCP_2_Off| > 10 Bar	The fault itself does not have much enable condition. Whenever an offset is learned, it is checked for result. To allow the learning, vehicle faster than some speed, vehicle accelerating, driver not on brake,	100 ms Goal: 18000	Type A. MIL Illumination.
BP_MODEL_TOO_HIGH_ERROR	C053D	This monitor checks if: Common cause Boost Pressure Sensor failure (in-range high)	The system models an expected boost pressure based on motor position change. This fault indicates that the boost pressure sensor indicates higher pressure than predicted by the model and than evidenced by the vehicle deceleration.	• Valid braking request (driver or autonomous) • BP_Model (MPS) < Boost pressure - 50 Bar • Vehicle deceleration is not observed	• Signal valid; • No ABS; • vehicle at speed and is slowing down. • driver not on throttle and requested enough pressure	500 ms Goal:18000	Type A. MIL Illumination.
BP_MODEL_TOO_LOW_ERROR	C053D	This monitor checks if: Common cause Boost_P failure (in-range-low)	The system models an expected boost pressure based on motor position change. This fault indicates that the boost pressure sensor indicates lower pressure than predicted by the model and than evidenced by the vehicle deceleration.	• Valid braking request (driver or autonomous) • BP_Model (MPS) > Boost pressure + 5 Bar • Vehicle deceleration is observed	• Signal valid; • No ABS; • DAP close to end position; • vehicle at speed not slowing down much; • driver not on throttle and requested enough pressure	500 ms Goal:18000	Type A. MIL Illumination.
BP1_CORRELATION_ERROR	C053D	This monitor checks if: BP1 signal failure	The BP1, BP2, and DAP position signals are used to compare and identify a single failed sensor signal	|Boost_P_1 – Boost_P_2| > 5 Bar	Input signals valid for some time (allow system/signal to initialize)	100 ms Goal: 18000	Type A. MIL Illumination.
BP2_CORRELATION_ERROR	C053D	This monitor checks if: BP2 signal failure	The BP1, BP2, and DAP position signals are used to compare and identify a single failed sensor signal	|Boost_P_1 – Boost_P_2| > 5 Bar	Input signals valid for some time (allow system/signal to initialize)	100 ms Goal: 18000	Type A. MIL Illumination.
BP_RAW_OFFSET_ERROR	C053D	This monitor checks if: Boost Pressure Sensor Failure	The offset required to zero the Boost Pressure sensor is larger than the specification limit of 50 bar.	|BP_RAW_Off| > 50 BAR	• Input signal valid; • Driver request, DAP position, suggest there should be no pressure; • Vehicle acceleration, vehicle at speed.	500 ms Goal:18000	Type A. MIL Illumination.
BP1_OFFSET_ERROR	C053D	This monitor checks if: BP1 signal failure	The offset required to zero the Boost Pressure sensor is larger than the specification limit	|BOOST_P_1_Off| > 10 Bar	The fault itself does not have much enable condition. Whenever an offset is learned, it is checked for result. To allow the learning, vehicle faster than some speed, vehicle accelerating, driver not on brake.	100 ms Goal: 18000	Type A. MIL Illumination.
BP2_OFFSET_ERROR	C053D	This monitor checks if: BP2 signal failure	The offset required to zero the Boost Pressure sensor is larger than the specification limit	|BOOST_P_2_Off| > 10 Bar	The fault itself does not have much enable condition. Whenever an offset is learned, it is checked for result. To allow the learning, vehicle faster than some speed, vehicle accelerating, driver not on brake.	100 ms Goal: 18000	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MC_PRES_SEN_ERRATIC	C053D	This monitor checks if: • Intermittent failure of the pressure sensor. • Intermittent open or short in the internal circuitry of the printed circuit board.	• Pressure Sensor Erratic • This diagnostic checks both raw Boost Pressure principle and reference signals.	Ohmic Fault Status = (Sensor open or shorted to sensor supply) AND (Sensor shorted to ground) Ohmic Fault Status ? Previous Ohmic Fault Status	• Sensor voltage supply in range • Boost Pressure Sensor is enabled	80 ms Goal: 800	Type A. MIL Illumination.
MC_PRES_SEN_SHORTED_LOW	C053E	This monitor checks if: • Defective pressure sensor. • Defective pressure sensor connector. • Defective printed circuit board. • Defective microprocessor feedback input port.	• Pressure Sensor Shorted Low • This diagnostic checks both raw Boost Pressure principle and reference signals.	principal sensor voltage < 4.61% of principle sensor supply voltage OR reference sensor voltage < 4.85% of reference sensor supply voltage	• Sensor voltage supply in range • Boost Pressure Sensor is enabled	100 ms	Type A. MIL Illumination.
MC_PRES_SEN_OPEN_OR_SHRT_HIGH	C053F	This monitor checks if: • Defective pressure sensor. • Defective pressure sensor connector. • Defective printed circuit board. • Defective microprocessor feedback input port.	• Pressure Sensor Open or Shorted High • This diagnostic checks both raw Boost Pressure principle and reference signals.	principal sensor voltage > 95.24% of principle sensor supply voltage OR reference sensor voltage > 94.50% of reference sensor supply voltage	• Sensor voltage supply in range • Boost Pressure Sensor is enabled	100 ms	Type A. MIL Illumination.
SC_PRES_SEN_SHORTED_LOW	C0571	This monitor checks if: • Defective pressure sensor. • Defective pressure sensor connector. • Defective printed circuit board. Defective microprocessor feedback input port.	• Pressure Sensor Shorted Low • This diagnostic checks both raw Boost Pressure principle and reference signals.	principal sensor voltage < 4.61% of principle sensor supply voltage OR reference sensor voltage < 4.85% of reference sensor supply voltage	• Sensor voltage supply in range • Secondary Circuit Pressure Sensor is enabled	100 ms	Type A. MIL Illumination.
SC_PRES_SEN_OPEN_OR_SHRT_HIGH	C0572	This monitor checks if: • Defective pressure sensor. • Defective pressure sensor connector. • Defective printed circuit board. Defective microprocessor feedback input port.	• Pressure Sensor Open or Shorted High • This diagnostic checks both raw Boost Pressure principle and reference signals.	principal sensor voltage > 95.24% of principle sensor supply voltage OR reference sensor voltage > 94.50% of reference sensor supply voltage	• Sensor voltage supply in range • Secondary Circuit Pressure Sensor is enabled	100 ms	Type A. MIL Illumination.
SC_PRES_SEN_ERRATIC	C0574	This monitor checks if: • Intermittent failure of the pressure sensor. • Intermittent open or short in the internal circuitry of the printed circuit board.	• Pressure Sensor Erratic • This diagnostic checks both raw Boost Pressure principle and reference signals.	Ohmic Fault Status = (Sensor open or shorted to sensor supply) AND (Sensor shorted to ground) Ohmic Fault Status ? Previous Ohmic Fault Status	• Sensor voltage supply in range • Secondary Circuit Pressure Sensor is enabled	80 ms Goal: 800	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PRESSURE_SENSOR_ MISSING_CALIBRATION	C0560	This monitor checks if: • Missing Calibration • NVRAM error	This fault only checks if the EOL calibration is sucessful or not. If the calibration was not yet done or if the calibration is not successful, then this fault is set. The NVRAM contains both calibrated offset and status, but only the status is checked to set the fault.	status != SUCCESSFUL	Any time after system wake up and read NVRAM	500 ms Goal:18000	Type A. MIL Illumination.
Group 14 - Steering Angle Sensor							
SWA_GAIN_ERROR	C0051	This monitor checks if: • Defective steering angle sensor. • Defective cable. • Defective printed circuit board. • Defective microprocessor feedback input port.	• Steering Wheel Angle Sensor - Gain Error • The monitoring recognizes offset faults as well as amplification fault.	Tight Check: Difference between zeroed measured SWA signal and estimated SWA signal > Tight Check threshold Tight check threshold is based on a function of vehicle speed, Ay and Yaw Rate with minimum threshold of 50 deg. Loose Check: Difference between zeroed SWA signal and estimated SWA signal > Loose Check threshold Loose check threshold is based on a function of vehicle speed, Ay and Yaw Rate with minimum threshold of 100 deg.	1. Yaw Rate, Lat Acc, SWA and wheel speed info are valid 2. MCP is initialized 3. Vehicle speed > 4.0 m/s while driving forward 4. Emissions Rolls Test Inactive Tight Check: 1. Driving is stable Loose Check: 1. Driving is marginally stable	If SWA gain error= 2*threshold Goal: 900 ms else Goal: 1.8 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SWA_OFFSET_ERROR	C0051	This monitor checks if: • electronic or mechanical fault in sensor • mechanical attachment of the sensor • incorrect wheel geometry	• Steering Angle Sensor - Offset Error • The SWA signal shows an offset out of specification.	Before Initialization: High offset: |Learned offset-Stored End of line offset from NVRAM| > 23° Low offset: |Learned offset-Stored End of line offset from NVRAM| > 18° After Initialization: |Learned offset-Stored End of line offset from NVRAM| > 18°	1. Yaw Rate, Lat Acc, SWA and wheel speed info are valid 2. MCP is initialized 3. Vehicle speed > 4.0 m/s while driving forward 4. Emissions Rolls Test Inactive Tight Check: 1. Driving is stable Loose Check: 1. Driving is marginally stable	Before initialization: High offset: 100 ms Low offset: 1.8 s After Initialization: 100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SWA_RAW_OFFSET_ERROR	C0051	This monitor checks if: • electronic or mechanical fault in sensor • mechanical attachment of the sensor • incorrect wheel geometry	• Steering Wheel Angle Sensor - Raw Offset • The SWA signal has to show an implausible high value before the initialization.	Difference between measured SWA and estimated SWA > 175° ABS(ABS(Yaw_Rate.Conv_To_Swa_s16) - ABS(Swa.Turn_Corrected_Delayed_s16)) > SWA_RAW_OFFSET_ERROR_THR_S16 SWA_RAW_OFFSET_ERROR_THR_S16= 175 deg	1. Yaw Rate, Lat Acc, SWA and wheel speed info are valid 2. MCP is initialized 3. Vehicle speed > 4.0 m/s while driving forward 4. Emissions Rolls Test Inactive Tight Check: 1. Driving is stable Loose Check: 1. Driving is marginally stable	200 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
SWA_MAX_VALUE_ERROR	C0051	This monitor checks if: • electronic or mechanical fault in sensor • mechanical attachment of the sensor • Incorrect wheel geometry	• Steering Angle Sensor – Max Value Error • The SWA signal shows a greater value than physically possible in the vehicle.	Absolute SWA sensor: |Swa Turn Corrected| > 720° OR Relative SWA sensor: |Swa Turn Corrected| > 1440° before initialization OR Relative SWA sensor: |Swa zeroed| > 720° after initialization	1. SWA is valid and calibrated 2. Emissions Rolls Test Inactive	200 ms OR 200 ms before initialization OR 200 ms after initialization	Type C, No MIL, "Emissions Neutral Diagnostic "
SWA_NOT_ALIVE_ERROR	C0051	This monitor checks if: • electronic or mechanical fault in sensor hardware	• Steering Wheel Angle - Not Alive Error,Also known as "Constant Value Fault" • The SWA signal does not change while the Yaw Rate changes:	|Yaw rate derivative| > 5°/s²	1. Yaw rate and SWA valid 2. Emissions Rolls Test Inactive 3. Wheel speed information valid 4. Vehicle speed > 2.5 m/s 5. Difference between wheel speeds front and rear ? 5 m/sec 6. Difference between measured and estimated Yaw rate < 6°/s 7. Yaw Rate has to be > 3°/s once and < -3°/s once	3 s	Type C, No MIL, "Emissions Neutral Diagnostic "
SWA_STEP_ERROR	C0051	This monitor checks if: • electronic or mechanical fault in sensor hardware	• Steering Wheel Angle Sensor - Step Error • The SWA signal has to show a gradient above a certain threshold.	Raw SWA signal change > 3000°/s Set previous signal for next cycle.	1. SWA is valid 2. Emissions Rolls Test Inactive	100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SWA_MISSING_CALIBRATION_ERROR	U0420	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• When the incoming message is unpacked, the calibration bit will be checked immediately.	StrWhlAngSenCalStat == 0x0	• Fault will not be set during the following conditions: • within the first 5 seconds after System Power Mode has transitioned to RUN • Supply Voltage is not in the range 9V <= V <= 16V • Within the first 5 seconds of recovery from an under or over voltage condition • CAN Bus Off Failure is latched	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
Group 15 - Lateral Acceleration Sensor							
LAT_SENSOR_NOT_ALIVE_ERROR	C0061	This monitor checks if: • electronic fault in sensor	• Lat Acceleration Sensor - Not Alive Fault • The Lat Acc signal does not change or is locked at a rail value. • This failure is set if the lateral acceleration sensor is not able to change its value anymore or if it is outside the specified max range.	1. lat acc signal ? +/- 25 m/s² OR 2. Lat Acc is constant lat acc signal < +/- 14 m/s² AND Vehicle Speed > 3 m/s²	Emissions Rolls Test Inactive AND 1. Lat Acc is valid Wheel speed is valid vehicle speed > 3 m/s²	1. 1 s 2. 100 msec	Type C, No MIL, "Emissions Neutral Diagnostic "
LAT_SENSOR_STEP_ERROR	C0061	This monitor checks if: • electronic fault in sensor • mechanical mounting of sensor	• Lat Acceleration Sensor - Step Error • The Lat Acc signal has to show a gradient above a certain threshold.	Raw Lat Acc signal change is > 800 m/s³	Lat accel is valid ABS is not active	100 msec	Type C, No MIL, "Emissions Neutral Diagnostic "
LAT_SENSOR_RAW_OFFSET_ERROR	C0061	This monitor checks if: • Sensor Open • Open circuit in ECU in series with sensor input	• Lat Acceleration Sensor - Raw Offset Error • The Lat Acc signal has to show an implausible high value while standing still.	Lat Acc signal > 6.5 m/sec²	• Lat Acc is valid • Wheel speed info is valid • Vehicle is standing still	200 ms	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
LAT_SENSOR_OFFSET_ERROR	C0061	This monitor checks if: • Sensor Open • Open circuit in ECU in series with sensor input	• Lat Acceleration Sensor - Offset Error • The Lat Acc signal shows an offset out of specification.	Before Initialization: 1. 1 Continuously learned offset is > 4 m/sec² OR 2. 2 Continuously learned offsets > 1.8 m/sec² for 4 sec WHILE vehicle speed > 13.8 m/s OR driving distance > 150m before initialization OR 3. 3 Continuously learned offsets > 3 m/s² for 4 sec WHILE vehicle speed < 13.8 m/sec AND driving distance < 150 m before initialization After Initialization:	• Lat Acc valid • Yaw Rate, wheel speed information and steering angle are valid • Vehicle speed > 4.2 m/sec • Stable forward driving	1. 100 ms 2. 1.8 s 3. 1.8 s 4. 100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
				4. 8 "extended learn" offsets are > 1.8 m/s² (Extended learn offsets are determined while vehicle driving straight over accumulated distances on the order of 250m)			

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
LAT_SENSOR_GAIN_ERROR	C0061	This monitor checks if: • electronic fault in sensor	• Lat Acceleration Sensor - Gain Error • This function computes the difference between the measured ay signal and an ay estimate, based on a vehicle model. If the difference between the two is above a threshold for a certain period of time, a sensor fault is set.	1. The difference between the measured Lat Acc (zeroed) and the estimated Lat Acc is > failure threshold OR 2. The difference between the measured Lat Acc (zeroed) and the estimated Lat Acc is > two times the failure threshold The fault basic threshold is based on the initialization state: Before Initialization: 4 m/sec² + delta After Initialization: 2 m/sec² + delta Where delta is based on the driving situation, a function of vehicle speed, Yaw Rate, or steering angle.	• No active Lat Accel fault • ay-signal is valid • Yaw Rate signal is valid • No active Wss faults • Vehicle-speed > 4.2 m/sec, while driving forward	1. 1.5 s 2. .75 s	Type C, No MIL, "Emissions Neutral Diagnostic "
				The model based on steering angle is considered to be the most robust one.			
Group 16 - Longitudinal Acceleration Sensor							
LONG_SENSOR_NOT_ALIVE_ERROR	C0551	This monitor checks if: • electronic fault in sensor	• Longitudinal Sensor - Constant Error • The Long Acc signal does not change or is locked at a rail value.	1. long acc signal >= +/- 25 m/s² OR 2. Long Acc is constant AND long acc signal < +/- 14 m/s² AND Vehicle Speed > 3 m/s²	• Emissions Rolls Test Inactive AND • Long Acc is valid • Wheel speed is valid • vehicle speed > 3 m/sec	1. 1 s 2. 100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
LONG_SENSOR_STEP_ERROR	C0551	This monitor checks if: • electronic fault in sensor • mechanical mounting of sensor	• Long Acceleration Sensor - Step Error • The Long Acceleration signal has to show a gradient above a certain threshold.	Raw Long Acc signal change is > 800 m/s³	• Long Acc is valid • ABS not active • Emissions Rolls Test Inactive	100 msec	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
LONG_SENSOR_RAW_OFFSET_ERROR	C0551	This monitor checks if: • electronic fault in sensor • mechanical mounting of the sensor	• Long Acceleration Sensor - Raw Offset Error • The Long Acc signal has to show an implausible high value while standing still.	Long Acc signal > 8 m/s²	• Long Acc is valid • Wheel speed info is valid • Vehicle is standing still • Emissions Rolls Test Inactive	200 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
LONG_SENSOR_OFFSET_ERROR	C0551	This monitor checks if: • electronic fault in sensor • mechanical mounting of sensor	• Long Acceleration Sensor - Offset Error • The Long Acc signal shows an offset out of specification.	3 continuously learned offsets are > 2.5 m/s²	• Long Acc is valid • Wheel speed information is valid • All four wheel speeds > 3 m/s • stable forward driving • No vehicle control activities such as ABS, TC, and VSC • Emissions Rolls Test Inactive	1. 100 ms 2. 1.8 s 3. 1.8 s 4. 10 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
LONG_SENSOR_GAIN_ERROR	C0551	This monitor checks if: • electronic fault in sensor	• Long Acceleration Sensor - Gain Error • This monitoring recognizes offset faults as well as amplification faults.	Change in estimated Long Acc > 0.2 m/s² AND Measured Long Acc-Estimated Long Acc > 0.8 m/s²	• Long Acc and wheel speed information are valid • All four wheel speeds > 3 m/s • Stable forward driving • Accelerator position gradient < 600%/sec • Emissions Rolls Test Inactive	200 msec	Type C, No MIL, "Emissions Neutral Diagnostic "
Group 17 - Yaw Rate Sensor							
YAW_SENSOR_NOT_ALIVE_ERROR	C0063	This monitor checks if: • electronic fault in sensor	• Yaw Rate Sensor – Not Alive Error • The Yaw Rate signal does not change or is locked at a rail value.	1. Yaw rate is constant AND |Yaw rate| < 85°/s AND Vehicle Speed > 3 m/s² 2. |Yaw rate| ? 130°/s	• Emissions Rolls Test Inactive AND 1. Yaw Rate is valid Wheel speed info is valid Vehicle speed > 3 m/s	1. 1 s 2. 100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
YAW_SENSOR_STEP_ERROR	C0063	This monitor checks if: • defective sensor • mechanical mounting of the sensor • Stone impingement at the floor pan	• Yaw Rate Sensor - Step Error • The Yaw Rate signal has to show a gradient above a certain threshold.	Yaw rate gradient > 800°/s²	• Yaw Rate is valid • Emissions Rolls Test Inactive	100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
YAW_SENSOR_RAW_OFFSET_ERROR	C0063	This monitor checks if: • electronic sensor fault	• Yaw Rate Sensor Raw Offset Error • The Yaw Rate signal has to show an implausible high value while standing still.	Low error threshold: If initialization info is valid and below threshold |Yaw rate| > 50°/s	• Yaw Rate is valid • Wheel speed info is valid • Vehicle is standing still • Emissions Rolls Test Inactive	200 ms	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
YAW_SENSOR_OFFSET_ERROR	C0063	This monitor checks if: • electronic sensor fault	• Yaw Rate Sensor - Offset Error • The Yaw Rate signal shows an offset out of specification.	While Standing Still 1 Continously learned offset > 5 deg/sec while vehicle standing still. (Offset must remain present as vehicle driven away following statndstill condition) Before Initialization while driving: 2 learned offset is > 8°/s OR 3 Continuously learned offsets are > 5°/s for 1 s After Initialization while driving: 4 "extended learn" offsets are > 5°/s during straight driving (Extended learn offsets are determined while vehicle driving straight over accumulated distances on the order of 250m)	• Yaw Rate is valid • Steering angle, Lat Acc and wheel speed informaiton are valid • Vehicle speed > 4.2 m/s • Stable forward driving • Emissions Rolls Test Inactive	1. 100 ms 2. 1.8 s 3. 100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
YAW_SENSOR_GAIN_ERROR	C0063	This monitor checks if: • electronic fault in sensor	• Yaw Rate Sensor - Gain Error • This monitoring recognizes offset faults as well as amplification faults.	1. The difference between the measured Yaw rate (zeroed) and the estimated Yaw rate is > failure threshold OR 2. The difference between the measured Yaw rate (zeroed) and the estimated Yaw rate is > two times the failure threshold The fault basic threshold is based on the initialization state: Before Initialization: 6°/s + delta After Initialization: 3°/s + delta Where delta is based on the driving situation, a function of vehicle speed, Ay, steering angle and steering angle derivative.	• Yaw Rate is valid • Steering angle, Lat Acc and wheel speed information are valid • Vehicle speed > 2.5 m/s driving forward • Emissions Rolls Test Inactive	1. 1 s 2. 500 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
Group 18 - Pedal Travel Sensor							

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PTS_TO_SCP_MODEL_ TOO_HIGH_ERROR	C05D2	This monitor checks if: • Master cylinder seal leakage to reservoir • Pedal Simulator seal leakage to reservoir • In-range failure of SCP sensor	The BHS function includes a model of expected simulator Pressure based on driver pedal position. MODEL_TOO_HIGH_ERROR detects the situation where the modeled pressure is much higher than the measured pressure. Given certain travel, some amount of minimun pressure is expected in the SC. Otherwise something is wrong.	BHS modeled pressure > SCP Measured Pressure + 20 Bar Look up table (add lookup table to appendices)	PTS > the minimum point on the lookup table	250 ms Goal 18000	Type A. MIL Illumination.
PTS_TO_SCP_MODEL_ TOO_LOW_ERROR	C05D3	This monitor checks if: • Pedal Simulator Valve is closed or blocked • Pedal Simulator seized/fails to store fluid • In-range failure of SCP sensor	The BHS function includes a model of expected simulator Pressure based on driver pedal position. MODEL_TOO_LOW_ERROR detects the situation where the modeled pressure is much lower than the measured pressure.	BHS modeled pressure < SCP Measured Pressure – 20 Bar	The brake event is not a fast apply (which may cause unpredictable high pressure)	250 ms Goal 18000	Type A. MIL Illumination.
PTS1_OUT_OF_RANGE _ERROR	C05CC	This monitor checks if: • Failure of PTS1 • Failure of travel sensor cursor rod	During normal operation the input piston travel is physically limited to ~25 mm, and during NO_BOOST operation it is limited to ~36 mm. The sensor is capable of measuring travel up to 43 mm. Reported travel by a single sensor in excess of these limits is indicative of a sensor error.	• PTS1 signal > 38 mm AND • PTS2 signal and SCP signal agree that actual travel is in range Not checking for SCP	Signal is valid	100ms Goal: 18000	Type A. MIL Illumination.
PTS2_OUT_OF_RANGE _ERROR	C05CF	This monitor checks if: • Failure of PTS2 • Failure of travel sensor cursor rod	During normal operation the input piston travel is physically limited to ~25 mm, and during NO_BOOST operation it is limited to ~36 mm. The sensor is capable of measuring travel up to 43 mm. Reported travel by a single sensor in excess of these limits is indicative of a sensor error.	• PTS2 signal > 38 mm AND • PTS1 signal and SCP signal agree that actual travel is in range Not checking for SCP	Signal is valid	100ms Goal: 18000	Type A. MIL Illumination.
PTS1_STEP_ERROR	C05CC	This monitor checks if: • Failure of PTS1 signal line	The PTS1 sensor signal changes at a physically implausible rate, resulting in a signal that disagrees with PTS2 signal, and a modeled pressure that disagrees with the SCP (i.e. PTS2 model and SCP signals agree on driver braking level, PTS1 model and SCP disagree)	• PTS1 signal gradient > 700 mm/s • |PTS1 – PTS2| > Error_threshold • Model(PTS1) <> SCP and Model(PTS2) == SCP	Signal is valid	100ms Goal: 18000	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PTS2_STEP_ERROR	C05CF	This monitor checks if: • Failure of PTS2 signal line	The PTS2 sensor signal changes at a physically implausible rate, resulting in a signal that disagrees with PTS1 signal, and a modeled pressure that disagrees with the SCP (i.e. PTS1 model and SCP signals agree on driver braking level, PTS2 model and SCP disagree)	• PTS2 signal gradient > 700 mm/s • |PTS1 – PTS2| > Error_threshold • Model(PTS2) <> SCP and Model(PTS1) == SCP	Signal is valid	100ms Goal: 18000	Type A. MIL Illumination.
PTS1_SENT_RECEIVE_ ERROR	C2A13	This monitor checks if: PTS1 SENT data error	The PTS2 SENT message is comprised of a 12 bit data value (pedal travel), a 12 bit data value (motor position), a 4 bit CRC, and a 4 bit status field.	PTS1 data < Lower_Threshold OR PTS1 data > Upper_Threshold OR PTS1 upper nibbles + PTS1 lower nibbles != 4095	Any of the following conditions: • SENT message Checksum error • SENT status field indicates receive failure • Received pedal travel is out-of-range low (0) • Received pedal travel is out-of-range high (4095)	5ms	Type A. MIL Illumination.
PTS2_SENT_RECEIVE_ ERROR	C2A14	This monitor checks if: PTS2 SENT data error	The PTS1 SENT message is comprised of a 12 bit data value, its 12 bit complement, a 4 bit CRC, and a 4 bit status field	PTS2 data < Lower_Threshold OR PTS2 data > Upper_Threshold	Any of the following conditions: • SENT message Checksum error • SENT status field indicates receive failure • Data value and its complement do not combine to 0xFFF • Received position is out-of-range low (0) • Received position is out-of-range high (4095)	5ms	Type A. MIL Illumination.
PTS1_SENT_MESSAGE _MISSING	C2A13	This monitor checks if: Signal line is open or shorted to GND. Shorted to supply Wiring	The SW indicates the failure to the driver interface and set the status of the received Pedal and Motor position value to invalid within FTTD_PEDAL_MOTOR POSITION_VALUE.	N/A	N/A	5 msec	Type A. MIL Illumination.
PTS2_MPS2_SENT_ME SSAGE_MISSING	C2A14	This monitor checks if: Signal line is open or shorted to GND. Shorted to supply Wiring	the SW indicates the failure to the driver interface and set the status of the received Pedal and Motor position value to invalid within FTTD_PEDAL_MOTOR POSITION_VALUE.	N/A	N/A	5 msec	Type A. MIL Illumination.
PTS1_CORRELATION_ ERROR	C05D0	This monitor checks if: PTS1 Signal Failure	The PTS1, PTS2, and BAS sensor signals are used in a 2-out-of-3 correlation scheme to identify a single failed sensor signal	• |PTS1 – PTS2| > 2 mm AND • |PTS1 – BAS| > 2 mm AND • |PTS2 – BAS| < 2 mm	Signal is valid	100ms Goal: 18000	Type A. MIL Illumination.
PTS2_CORRELATION_ ERROR	C05D0	This monitor checks if: PTS2 Signal Failure	The PTS1, PTS2, and BAS sensor signals are used in a 2-out-of-3 correlation scheme to identify a single failed sensor signal	• |PTS1 – PTS2| > 2 mm AND • |PTS2 – BAS| > 2 mm AND • |PTS1 – BAS| < 2 mm	Signal is valid	100ms Goal: 18000	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PTS_MISSING_CALIBRATION_ERROR	C05D4	This monitor checks if: • Missing Calibration • NVRAM error	The PTS calibrations are stored in NVRAM and reused at the start of each drive cycle. This fault sets if the stored status indicates one of the failure cases for calibration: • PTS sensor electrical fault • Vehicle moving during calibration • Brake applied during calibration • Offset too big • Offset too small • Offset not steady	not SUCESSFUL	• PTS EOL zeroing was not completed successfully After system start up and read from NVRAM	10 msec	Type A. MIL Illumination.
PTS1_OFFSET_ERROR	C05CC	This monitor checks if: • defective sensor • mechanical mounting of the sensor	The offset required to zero the PTS sensor is larger than the specification limit.	|PTS1 Offset| > 2.5 mm	The fault itself does not have much enable condition. Whenever an offset is learned, it is checked for result. To allow the learning, vehicle faster than some speed, vehicle accelerating, driver not on brake.	100ms Goal: 18000	Type A. MIL Illumination.
PTS2_OFFSET_ERROR	C05CF	This monitor checks if: • defective sensor • mechanical mounting of the sensor	The offset required to zero the PTS sensor is larger than the specification limit.	|PTS2 Offset| > 2.5 mm	The fault itself does not have much enable condition. Whenever an offset is learned, it is checked for result. To allow the learning, vehicle faster than some speed, vehicle accelerating, driver not on brake.	100ms Goal: 18000	Type A. MIL Illumination.
Group 19 - Motor Position							
MPS2_CORRELATION_ERROR	C058E	This monitor checks if: • MPS2 Failure • Note: MPS1 failure results in BOOSTED_BRAKE_SYSTEM_FAILURE for lack of motor rotation / pressure build	MPS1 is SPI based with a 50 usec update rate. MPS2 is SENT based with a 1 msec update rate. During motor rotation there is an expected difference in MPS1 and MPS2 based on the different time sampling rates (time lag on MPS2). MPS 1 and 2 moving different direction; or MPS 1 and 2 stopped at different relative postion than history	|MPS1 – MPS2| > 2 Degrees + 3 Degrees (motor speed offset) MPS 1 and 2 moving different direction; or MPS 1 and 2 stopped at different relative postion than history	Signal is valid	100 ms Goal: 18000	Type A. MIL Illumination.
MPS1_STEP_ERROR	C058A	This monitor checks if: MPS1 Signal Failure	DAP position move more than a specified amount of distance within one loop.	DAP - DAP_prev > 205 mm/s	start 100 ms after DAP finished calibration	10ms Goal: 18000	Type A. MIL Illumination.
MPS2_SENT_RECEIVE_ERROR	C2A1A	This monitor checks if: MPS2 Signal Failure	Monitor MPS2 sent data received from the SentSensor.	This failsafe detects when MPS2 sent data received from the SentSensor is out of the valid range.	MPS signal data is received.	5 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MPS_BIST_FAULT	C058A	This monitor checks if: MPS Built-in-Self-Test failure	Testing of this module should include running BIST at various MPS angles. The ECU performs an independent calculation parallel to internal MPU sensor BIST software. The fault will occur when the parallel calculations don't match.	The value calculated within the MPS does not equal the ECU calculated value.	BIST Inputs are not faulty.	3 counts	Type A. MIL Illumination.
MPS1_NOT_ALIVE_FAILURE	C058A	This monitor checks if: MPS1 Signal Failure	Any Condition	MPS == MPS_prev	MPS1 does not change for 5 consecutive readings.	100ms	Type A. MIL Illumination.
Group 22 - Power Supply Failures							
SYS_ASIC_VDBAT_RANGE_FAILURE	U3006	This monitor checks if: • VDBAT Voltage is outside the voltage range	• KL30_1 Supply voltage outside of the specified range • If the ASIC A/D value for VDBat is outside the acceptable range (VDBat < 6V or VDBat >25V) continuously for 100ms then the fault is set.	6V < KL30_1 Supply Voltage > 25V	• ASIC's VDBAT Voltage Result SPI field is outside the range of 6 and 25 volts for 100msec	100ms	Type A. MIL Illumination.
SYS_ASIC_PDBAT_RANGE_FAILURE	U3007	This monitor checks if: • PDBAT Voltage is outside the voltage range	• KL30_2 Supply voltage outside of the specified range • If the ASIC A/D value for PDBat is outside the acceptable range (PDBat < 6V or PDBat >23V) continuously for 100ms then the fault is set.	6V < KL30_2 Supply Voltage > 23V	• ASIC's PDBAT Voltage Result SPI field is outside the range of 6 and 23 volts for 100msec	100ms	Type A. MIL Illumination.
KL30_1_OPEN_OR_SHRTED_TO_GND	U3006	This monitor checks if: • Fuse blown (Open) • Short_to_Ground	A feedback ratio is calculated based on the KL30_1_Fdbk_A and KL30_2_Fdbk_B. • If this feedback ratio exceeds the valid upper threshold ratio, then KL30_2_Open_or_Shrted_to_Gnd fault is set. • If the feedback ratio is lower than the valid lower threshold ratio, then KL30_1_Open_or_Shrted_to_Gnd fault is set	• If PSSW1 AND PSSW2 is turned ON, • Valid upper and lower threshold ratio is +10% and -10% of Supply Voltage, • If only PSSW1 OR PSSW2 is turned ON, • Valid upper and lower threshold ratio is +30% and -30% of Supply Voltage. 0V < KL30_2 Supply Voltage < 20.45V	• Power ON, Continuous Failsafing	75ms	Type A. MIL Illumination.
KL30_2_OPEN_OR_SHRTED_TO_GND	U3007	This monitor checks if: • Fuse blown (Open) • Short_to_Ground	A feedback ratio is calculated based on the KL30_1_Fdbk_A and KL30_2_Fdbk_B. • If this feedback ratio exceeds the valid upper threshold ratio, then KL30_2_Open_or_Shrted_to_Gnd fault is set. • If the feedback ratio is lower than the valid lower threshold ratio, then KL30_1_Open_or_Shrted_to_Gnd fault is set	• If PSSW1 AND PSSW2 is turned ON, • Valid upper and lower threshold ratio is +10% and -10% of Supply Voltage, • If only PSSW1 OR PSSW2 is turned ON, • Valid upper and lower threshold ratio is +30% and -30% of Supply Voltage. 0V < KL30_2 Supply Voltage < 20.45V	• Power ON, Continuous Failsafing	75ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYSTEM_VOLTAGE_LOW	P0562	This monitor checks if: • Voltage Supply is providing low voltage levels. • Defective cables. • Defective printed circuit board.	System voltage is monitored continuously but the fault is not enabled during Engine crank. When the system voltage is continuously lower than 8.5V for more than 150 msec then the fault is set. When the system voltage is continuously greater than 9.0V for more than 100 msec then the fault is cleared.	Filtered system voltage < 8.5V	• Engine is not being cranked • System is not re-initializing or shutting down • System is not shutting down	150 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
SYSTEM_VOLTAGE_EXCESSIVE_LOW	P0562	This monitor checks if: • Voltage Supply is providing excessively low voltage level. • Defective cable. • Defected printed circuit board.	System voltage is monitored continuously but the fault is not enabled during Engine crank. When the system voltage is continuously lower than 7.5V for more than 150 msec then the fault is set.	Filtered system voltage < 7.5V	• Engine is not being cranked • System is not re-initializing or shutting down • System is not shutting down	150 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
SYSTEM_VOLTAGE_HIGH	P0563	This monitor checks if: • Voltage Supply is providing high voltage levels. • Defective printed circuit board.	System voltage is monitored continuously but the fault is not enabled during Engine crank. When the system voltage is continuously greater than 16.8V for more than 100 msec then the fault is set. When the system voltage is continuously less than 16.3V for more than 100 msec then the fault is cleared.	Filtered system voltage > 16.8 V	• Engine is not being cranked • System is not re-initializing or shutting down • System is not shutting down	100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
SYSTEM_VOLTAGE_EXCESSIVE_HIGH	P0563	This monitor checks if: • Voltage Supply is providing excessively high voltage levels. • Defective printed circuit board.	System voltage is monitored continuously but the fault is not enabled during Engine crank. When the system voltage is continuously greater than 18.8V for more than 15 msec then the fault is set. When the system voltage is continuously less than 18.3V for more than 100 msec then the fault is cleared.	Filtered system voltage > 18.8V	• Engine is not being cranked • System is not re-initializing or shutting down • System is not shutting down	15 ms	Type C, No MIL, "Emissions Neutral Diagnostic "
SYSTEM_VOLTAGE_ECU_SELF_TEST_HOLD	P0562	This monitor checks if: • Voltage Supply is providing excessively high voltage levels. • Defective printed circuit board.	System Self Test will not start if either of the following conditions are present: System is not initialized System Voltage is outside the Excessive range (< 7.5V or >18.8V) If the System Self Test is delayed continuously for more than 100 msec then the fault is set.	Filtered system voltage < 7.5V or Filtered system voltage > 18.8V	• System is not initialized • System Voltage is outside the Excessive range (<7.5 V or >18.8V)	100 ms	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYSTEM_VOLTAGE_ERRATIC	P0562	This monitor checks if: • Voltage Supply is toggling between low voltage levels to High voltage levels. • Defective cables. • Defective printed circuit board.	If the filtered System Voltage toggles outside the Excessive Low or Excessive High range but does not stay there long enough to mature the fault then this fault is matured by an up/down counter on the condition	If the Filtered sysem voltage toggles as per the below range Filtered system voltage ? 8.5V Filtered system voltage ? 16.8 V	• Engine is not being cranked • System is not re-initializing or shutting down • System is not shutting down	300ms minimum	Type C, No MIL, "Emissions Neutral Diagnostic "
PRIMARY_WAKEUP_LINE_STUCK_LOW	P2534	This monitor checks if: HW ignition line failure	The MCU compares the state of the Primary Wakeup Line with the Engine Cranking CAN signal from the ECM. If the Primary Wakeup Line is read as Low but is mismatched with a True Engine Cranking signal for a continuous 3 sec then the fault is set This fault is not enabled if the Missing PPEI Engine General Status 1 CAN message fault is set.	State of Primary Wakeup line != Engine Cranking CAN Signal from ECM	• Primary Wakeup COMMS Signal is Valid (Singal is Valid when MISSING_PPEI_ENGINE_GENERAL_STATUS_1 fault is not latched)	3s	Type A. MIL Illumination.
PRIMARY_WAKEUP_LINE_STUCK_HIGH	P2535	This monitor checks if: HW ignition line failure	The MCU compares the state of the Primary Wakeup Line with the Engine Cranking CAN signal from the ECM. If the Primary Wakeup Line is read as High but is mismatched with a False Engine Cranking signal for a continuous 3 sec then the fault is set This fault is not enabled if the Missing PPEI Engine General Status 1 CAN message fault is set.	State of Primary Wakeup line != Engine Cranking CAN Signal from ECM	• Primary Wakeup COMMS Signal is Valid (Singal is Valid when MISSING_PPEI_ENGINE_GENERAL_STATUS_1 fault is not latched) • AND • Primary Wakeup Line is ON	3s	Type A. MIL Illumination.
SECONDARY_WAKEUP_LINE_STUCK_LOW	P2537	This monitor checks if: HW ignition line failure	The MCU compares the state of the Secondary Wakeup Line with the Propulsion System Active CAN signal from the ECM. If the Secondary Wakeup Line is read as Low but is mismatched with a True Propulsion System Active signal for a continuous 1 sec then the fault is set This fault is not enabled if the Missing PPEI Propulsion Gen Stat 1 CAN message fault is set.	State of Secondary Wakeup line != Engine Cranking CAN Signal from ECM	• 5ms after CRANK • Secondary Wakeup COMMS Signal is Valid (Singal is Valid when MISSING_PPEI_PROPULSION_GEN_STAT_1_HS fault is not latched) • Secondary Wakeup Line is ON	1s	Type B. MIL Illumination.
INTERNAL_5V_SUPPLY_VOLT_ERRATIC	P0606	This monitor checks if: • Defective internal 5 V supply circuit • Defective printed circuit board • Defective microprocessor feedback input port • Defective Polaris ASIC feedback input port	If the filtered 5V supply toggles outside the allowed range but does not stay there long enough to mature the INTERNAL_5V_SUPPLY_VOLT_FAILURE then this fault is matured by an up/down counter on the condition	If the filtered System Voltage toggles as per the below range Filtered system voltage ? 4.75V Filtered system voltage ? 5.25 V	• Internal 5V supply is enabled • AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	800 counts/80ms minimum	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ECU_SELF_TEST_TIME OUT	P0606	This monitor checks if: Faulted ECU	If the ECU self test does not complete in the alloted amount of time, then set this fault. This fault allows to properly inform the driver that the EBCM functionality is not available.	None	Runs duting startup	5 msec	Type A. MIL Illumination.
PWR_PTS_MPS_SUP1_ RANGE_LOW	C05D1	This monitor checks if: • Defective motor position sensor • Defective pedal travel sensor • Defective printed circuit board	The MCU provides two 5V sensor supplies for the Pedal Travel and Motor Position Sensors (each supply powers one circuit of the PTS and one circuit of the MPS). The MCU monitors the feedbacks on these two voltage supplies. If either supply is continuously < 4.85V for 100ms then the respective supply fault is set.	if PWR<4.85 for 100ms	• MPS1 sensor is enabled • PTS1 sensor is enabled AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	100ms	Type A. MIL Illumination.
PWR_PTS_MPS_SUP1_ RANGE_HIGH	C05D1	This monitor checks if: • Defective motor position sensor • Defective pedal travel sensor • Defective printed circuit board	The MCU provides two 5V sensor supplies for the Pedal Travel and Motor Position Sensors (each supply powers one circuit of the PTS and one circuit of the MPS). The MCU monitors the feedbacks on these two voltage supplies. If either supply is continuously > 5.15V for 100ms then the respective supply fault is set.	if PWR>5.15V for 100ms	• MPS1 is enabled • PTS1 is enabled AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	100ms	Type A. MIL Illumination.
PWR_PTS_MPS_SUP1_ ERRATIC	C05D1	This monitor checks if: • Defective motor position sensor • Defective pedal travel sensor • Defective printed circuit board	The MCU provides two 5V sensor supplies for the Pedal Travel and Motor Position Sensors (each supply powers one circuit of the PTS and one circuit of the MPS). The MCU monitors the feedbacks on these two voltage supplies. If a supply feedback is outside the acceptable range (< 4.85V or > 5.15V) then the respective erratic fault is matured at a weight of 50 toward a goal of 800 (fastest maturation = 80 msec). If the feedback voltage returns within the 4.85 - 5.15V range then the erratic fault is dematured at a weight of 1. Once the fault goal is reached then the fault is set and is ignition latched.	if PWR<4.85 or >5.15V	• MPS1 is enabled • PTS1 is enabled AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	80ms minimum	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PWR_PTS_MPS_SUP2_RANGE_LOW	C05BB	This monitor checks if: • Defective motor position sensor • Defective pedal travel sensor • Defective printed circuit board	The MCU provides two 5V sensor supplies for the Pedal Travel and Motor Position Sensors (each supply powers one circuit of the PTS and one circuit of the MPS). The MCU monitors the feedbacks on these two voltage supplies. If either supply is continuously < 4.85V for 100ms then the respective supply fault is set.	if PWR<4.85 for 100ms	• MPS2 is enabled • PTS2 is enabled AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	100ms	Type A. MIL Illumination.
PWR_PTS_MPS_SUP2_RANGE_HIGH	C05BB	This monitor checks if: • Defective motor position sensor • Defective pedal travel sensor • Defective printed circuit board	The MCU provides two 5V sensor supplies for the Pedal Travel and Motor Position Sensors (each supply powers one circuit of the PTS and one circuit of the MPS). The MCU monitors the feedbacks on these two voltage supplies. If either supply is continuously > 5.15V for 100ms then the respective supply fault is set.	if PWR>5.15V for 100ms	• MPS2 is enabled • PTS2 is enabled AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	100ms	Type A. MIL Illumination.
PWR_PTS_MPS_SUP2_ERRATIC	C05BB	This monitor checks if: • Defective motor position sensor • Defective pedal travel sensor • Defective printed circuit board	The MCU provides two 5V sensor supplies for the Pedal Travel and Motor Position Sensors (each supply powers one circuit of the PTS and one circuit of the MPS). The MCU monitors the feedbacks on these two voltage supplies. If a supply feedback is outside the acceptable range (< 4.85V or > 5.15V) then the respective erratic fault is matured at a weight of 50 toward a goal of 800 (fastest maturation = 80 msec). If the feedback voltage returns within the 4.85 - 5.15V range then the erratic fault is dematured at a weight of 1. Once the fault goal is reached then the fault is set and is ignition latched.	if PWR<4.85 or >5.15V	• MPS2 is enabled • PTS2 is enabled AND • None of the following are taking place: • System is initializing • System is re-initializing • Engine is being cranked • When requested by Diagnostic commands System is shutting down	80ms minimum	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PWR_SW_COIL_SUP_OPEN	C053B	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30 supply inputs are switched on/off by the two Power Switches. The downstream KL30_INT supplies the ABS Coils, the BB Coils and the Motor Driver. These three circuits are individually switched on/off by separate Safety Relays. When the Safety Relay is on the downstream voltage feedback is expected to be high. The MCU monitors the voltage feedback downstream from the ABS Coil Safety Relay. If the feedback voltage is less than 80% of KL30_INT for a continuous 50 msec then the fault is set.	If Feedback Voltage < 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.
PWR_SW_COIL_SUP_SHORT	C053B	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30 supply inputs are switched on/off by the two Power Switches. The downstream KL30_INT supplies the ABS Coils, the BB Coils and the Motor Driver. These three circuits are individually switched on/off by separate Safety Relays. When the Safety Relay is off the downstream voltage feedback is expected to be low. The MCU monitors the voltage feedback downstream from the ABS Coil Safety Relay. If the feedback voltage is not less than 80% of KL30_INT for a continuous 50 msec then the fault is set.	If Feedback Voltage > 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.
PWR_SW_BB_COIL_SUP_OPEN	C053B	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30 supply inputs are switched on/off by the two Power Switches. The downstream KL30_INT supplies the ABS Coils, the BB Coils and the Motor Driver. These three circuits are individually switched on/off by separate Safety Relays. When the Safety Relay is on the downstream voltage feedback is expected to be high. The MCU monitors the voltage feedback downstream from the BB Coil Safety Relay. If the feedback voltage is less than 80% of KL30_INT for a continuous 50 msec then the fault is set.	If Feedback Voltage < 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PWR_SW_BB_COIL_SUP_SHORT	C053B	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30 supply inputs are switched on/off by the two Power Switches. The downstream KL30_INT supplies the ABS Coils, the BB Coils and the Motor Driver. These three circuits are individually switched on/off by separate Safety Relays. When the Safety Relay is off the downstream voltage feedback is expected to be low. The MCU monitors the voltage feedback downstream from the BB Coil Safety Relay. If the feedback voltage is not less than 80% of KL30_INT for a continuous 50 msec then the fault is set.	If Feedback Voltage > 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.
PWR_SW_MOT_SUP_OPEN	C0595	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30 supply inputs are switched on/off by the two Power Switches. The downstream KL30_INT supplies the ABS Coils, the BB Coils and the Motor Driver. These three circuits are individually switched on/off by separate Safety Relays. When the Safety Relay is on the downstream voltage feedback is expected to be high. The MCU monitors the voltage feedback downstream from the Motor Safety Relay. If the feedback voltage is less than 80% of KL30_INT for a continuous 50 msec then the fault is set.	If Feedback Voltage < 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.
PWR_SW_MOT_SUP_SHORT	C0595	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30 supply inputs are switched on/off by the two Power Switches. The downstream KL30_INT supplies the ABS Coils, the BB Coils and the Motor Driver. These three circuits are individually switched on/off by separate Safety Relays. When the Safety Relay is off the downstream voltage feedback is expected to be low. The MCU monitors the voltage feedback downstream from the Motor Safety Relay. If the feedback voltage is not less than 80% of KL30_INT for a continuous 50 msec then the fault is set.	If Feedback Voltage > 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
PWR_SW_PSSW1_SUP_OPEN	U3006	This monitor checks if: • Disconnected Switch • PCB Problem	This fault is not enabled is a Watchdog fault is already set. The KL30_1 and KL30_2 voltage supply inputs are individually switched on/off by separate Power Switch circuits. When either Switch is turned on then it's respective Power Switch Feedback is expected to be high. If the feedback voltage is less than 80% of it's respective KL30_x supply voltage for a continuous 50 msec then the fault is set	If Feedback Voltage < 80%of KL30_x	• Power ON, Continuous Failsafing	50 msec	Type A. MIL Illumination.
PWR_SW_PSSW1_SUP_SHORT	U3006	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30_1 and KL30_2 voltage supply inputs are individually switched on/off by separate Power Switch circuits. When both Switches are turned off then both Power Switch Feedbacks are expected to be low. If the feedback voltage is not less than 80% of it's respective KL30_x supply voltage for a continuous 50 msec then the fault is set.	If Feedback Voltage > 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.
PWR_SW_PSSW2_SUP_OPEN	U3007	This monitor checks if: • Disconnected Switch • PCB Problem	This fault is not enabled is a Watchdog fault is already set. The KL30_1 and KL30_2 voltage supply inputs are individually switched on/off by separate Power Switch circuits. When either Switch is turned on then it's respective Power Switch Feedback is expected to be high. If the feedback voltage is less than 80% of it's respective KL30_x supply voltage for a continuous 50 msec then the fault is set.	If Feedback Voltage < 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.
PWR_SW_PSSW2_SUP_SHORT	U3007	This monitor checks if: • Disconnected Switch • PCB Problem	The KL30_1 and KL30_2 voltage supply inputs are individually switched on/off by separate Power Switch circuits. When both Switches are turned off then both Power Switch Feedbacks are expected to be low. If the feedback voltage is not less than 80% of it's respective KL30_x supply voltage for a continuous 50 msec then the fault is set.	If Feedback Voltage > 80%of KL30_x	• Power ON, Continuous Failsafing	50ms	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_VCP12_U12_VOLTAGE_LOW	P0606	This monitor checks if: Defective vehicle battery or Charging system Otherwise: -Defective system ASIC -Defective printed circuit board. • Defective system ASIC	The Polaris ASIC provides an internal VCP12 voltage regulator which is required to operate the I_SSR amplifier and to maintain regulation of the VA5p0 regulators and the U3 and U1 linear regulators. If the VCP12 voltage is less that 7.25 V for 44 ?sec then the Polaris sets the VPC12 Low Voltage Warning SPI bit to True. Software monitors this SPI bit. If it is continuously True for more than 100 msec then the fault is set.	VCP12 voltage is less that 7.25 V for 44 ?sec	• Polaris is initialized	100 msec	Type A. MIL Illumination.
SYS_ASIC_CHARGE_PUMP_OVER_VOLT	P0606	This monitor checks if: • Defective system ASIC	The Polaris ASIC provides a two-stage charge pump to produce a voltage greater than the VCP12 voltage. If the charge pump voltage exceeds VCP12 voltage by more than 13V for 53 msec then the Polaris sets the Charge Pump Overvoltage Limit SPI bit to True. Software monitors this SPI bit. If it is continuously True for more than 100 msec then the fault is set.	charge pump voltage exceeds VCP12 voltage by more than 13V for 53 msec	• Polaris is initialized	100 msec (145.2 ms)	Type A. MIL Illumination.
SYS_ASIC_VDG_RANGE_FAULT	P0606	This monitor checks if: • Defective system ASIC	Verify that the KL30_1 Power Switch command is not stuck On. The ASIC VDG pin controls the KL30_1 Power Switch. While the Power Switch is commanded off, the SW reads the ASIC's VDG voltage feedback. When the VDG voltage is continuously >= 1.0V for more than 100 msec then the fault is set.	SSR ON: VDBat+3V <= VDG <= VDBat+12V SSR OFF: VDG <= 1.0V	• Polaris is initialized	100 msec	Type A. MIL Illumination.
SYS_ASIC_VBAT_SW_OVERCURRENT	P0606	This monitor checks if: • Defective system ASIC	The Polaris ASIC provides an overcurrent protected VBAT_SW output used for powering sensors and external circuits. If the VBAT_SW current draw exceeds 150 mA for 800 ?sec then the Polaris sets the VBAT_SW Overcurrent SPI bit to True. Software monitors this SPI bit. If it is continuously True for more than 25 msec then the fault is set.	VBAT_SW Enable and VBAT_SW Over-Current SPI bits are both TRUE	• Polaris is initialized	25 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_VBAT_SW_CORR	P0606	This monitor checks if: • Defective system ASIC	The MCU shall read the ASIC's VBAT_SW Voltage Result SPI field and perform a plausibility check against the measured VBAT voltage pin on the MCU. When the difference between the two voltage values is continuously > 1.75V for more than 25 msec then the fault is set.	voltage difference > 1.75 volts	• Polaris is initialized	15 msec	Type A. MIL Illumination.
SYS_ASIC_VBAT_SW_DISABLE_CORR	P0606	This monitor checks if: • Defective wiring harness • Defective ASCI • Defective CPU • Defective circuit board	Check that the ASIC VBAT_SW output is not leaking or stuck On. The MCU shall read the ASIC's VBAT_SW Voltage Result SPI field when the commanded VBAT_SW state is Off. If the voltage is continuously > 1.5V for more than 25 msec then the fault is set.	voltage difference > 1.5 volts	-Polaris is initialized -Power Switch is OFF	25 msec	Type A. MIL Illumination.
SYS_ASIC_U5_FAILURE	P0606	This monitor checks if: • Defective system ASIC	The U5 power supply regulates battery voltage down to 5V to supply such circuits as network communication transceivers, internal sensors and ADC references. If U5 is outside the acceptable range (<4.75V or >5.1V) continuously for 105 ?sec then the ASIC shall continue to attempt to regulate U5 and set the U5 Out of Range Warning SPI bit to True. Software monitors this SPI bit. If it becomes True then the fault is set immediately.	The MCU shall monitor the ASIC's U5 Out of Range Warning SPI bit. (<4.75V or >5.1V)	• Polaris is initialized	5 msec	Type A. MIL Illumination.
SYS_ASIC_CHARGE_PUMP_UNDER_VOLT	P0606	This monitor checks if: • Defective system ASIC	The Polaris ASIC provides a two-stage charge pump to produce a voltage greater than the VCP12 voltage. If the charge pump voltage exceeds VCP12 voltage by less than 9.5V for 5.5 msec then the Polaris sets the Charge Pump Undervoltage Limit SPI bit to True. Software monitors this SPI bit. If it is continuously True for more than 100 msec then the fault is set.	If the charge pump voltage exceeds VCP12 voltage by less than 9.5V for 5.5 msec	• Polaris is initialized	100 msec (105.5 ms)	Type A. MIL Illumination.
U5_ASIC_ADC_REF_FAULT	P0606	This monitor checks if: • Defective system ASIC or circuit board	The 5V regulated supply is read at the ASIC. If it is not within the range, then the fault is set.	Asic U5 is not within the 4.75V and 5.25V	Polaris is initialized	80 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SYS_ASIC_U3_UV_RESET_FAULT	P0606	This monitor checks if: • ASIC power supply block problem • Defective ASIC • PCB problem	• When the U5, U3, or U1 Undervoltage Diagnostic SPI bit is set, the ASIC shall raise the effective U5 out of range lower warning level, or the U3 or U1 undervoltage fault threshold above the maximum U5, U3, or U1 regulation voltage, thus forcing a U5 out of range warning or U3 or U1 undervoltage fault. • Periodically, the MCU shall store a flag in NVM indicating that it will perform a U5, U3 or U1 undervoltage diagnostic. The MCU shall then force one of the three test modes and start a timer.	The MCU shall detect a fault if it does not receive a reset within the expected time. If a reset occurs, the MCU shall check NVM and the ASIC's Reset Source SPI Register, and verify that the reset was due to a planned test.	• Runs during initialization	10 msec	Type A. MIL Illumination.
SYS_ASIC_U3_OV_RESET_FAULT	P0606	This monitor checks if: • ASIC power supply block problem • Defective ASIC • PCB problem	• When the U5, U3, U1 Overvoltage Diagnostic SPI bit is set, the ASIC shall lower the effective overvoltage fault threshold below the minimum U5, U3, or U1 regulation voltage, thus forcing a U5, U3, or U1 overvoltage fault. • Periodically (e.g. once per ignition cycle at shutdown), the MCU shall	The MCU shall detect a fault if it does not receive a reset within the expected time. If a reset occurs, the MCU shall check NVM and the ASIC's Reset Source SPI Register, and verify that the reset was due to a planned test.	• Runs during initialization	10 msec	Type A. MIL Illumination.
SYS_ASIC_U5_OV_RESET_FAULT	P0606	This monitor checks if: • ASIC power supply block problem • Defective ASIC • PCB problem	• When the U5, U3, U1 Overvoltage Diagnostic SPI bit is set, the ASIC shall lower the effective overvoltage fault threshold below the minimum U5, U3, or U1 regulation voltage, thus forcing a U5, U3, or U1 overvoltage fault. • Periodically (e.g. once per ignition	The MCU shall detect a fault if it does not receive a reset within the expected time. If a reset occurs, the MCU shall check NVM and the ASIC's Reset Source SPI Register, and verify that the reset was due to a planned test.	• Runs during initialization	10 msec	Type A. MIL Illumination.
Group 20 - BOOST SYSTEM							
BOOSTED_BRAKE_SYSTEM_DYNAMIC_LEAK	C05B0	This monitor checks if: Monitors for leaks in the braking system at the circuit level during braking events. This is different from the Static Leak check which looks for leaks at the channel level at shutdown.	The leak detection logic compares pressure gradient threshold against the measured pressure gradient. Once the error last longer than a time threshold, and the pressure error integral passes its threshold, leak is detected. The pressure gradient can be estimated from Dap flow rate and PV information; Similarly, pressure can be estimated from Dap volume and PV information. Here the worst case PV is taken	There are 12 calibrations associated with this failsafe so it is impossible to describe the interation of all of them in this document. Ulitimately when the pressure error integral exceeds 20 bar AND the pressure gradient error integral exceeds 3000 Bar/s the fault is set.	Boost control active Boost pressure > 2 Bar Advancing DAP (no replenishment mode) No slip control active Faded brakes have not been detected	1 msec	Type A. MIL Illumination.
BOOSTED_BRAKE_SYSTEM_LEAK_ISO_FAILED	C05B0	This monitor checks if: Set if the leakage circuit cannot be isolated successfully	Brake fluid leak on a channel or circuit without the ability to identify the location of the leak	N/A	BOOSTED_BRAKE_SYSTEM_DYNAMIC_LEAK already present.	5 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
BOOST_POWER_MANAGEMENT_ENABLED_WARNING	P0562	This monitor checks if: This fault is set if the Power mode is not in Crank, and the System Voltage is outside an under_volt_threshold of 8.5 V.	This fault is set if the Power mode is not in Crank, and the System Voltage is outside an under_volt_threshold of 8.5 V.	230 msec	Disabled in Crank mode	20 msec	Type A. MIL Illumination.
BOOST_POWER_MANAGEMENT_ACTIVE_FAILURE	P0562	This monitor checks if: This fault is set if the Power mode is not in Crank, and the System Voltage is outside an under_volt_threshold of 7.4 V.	This fault is set if the Power mode is not in Crank, and the System Voltage is outside an under_volt_threshold of 7.4 V.	Motor Voltage < 7.4V	Disabled in Crank mode	20 msec	Type A. MIL Illumination.
BOOST_SYSTEM_FADED_BRAKES_DETECTED	C0072	This monitor checks if: Monitor the estimated brake rotor temperatures, the system compliance, the boost pressure, and the measured deceleration during braking events. Based on a model calculate a Brake Fade Factor that will detect brake fade.	If the fade factor is greater than TBD for TBD msec, this fault is set.	Average brake rotor temperature > 400C Brake Fade Factor > 50% 2 conditions above exists for 800 msec	Boost control active No slip control active Vehicle speed > 4 m/s	800 msec	Type A. MIL Illumination.
PTU_ESTABLISH_HOME_POSITION	C0021	This monitor checks if: Set if motor could not find home position during startup	Motor could not find home position in 4sec. Motor gets stuck somewhere	Motor still moving to find home position for 4 sec	Cycle IGN or Clear Code	1 msec	Type A. MIL Illumination.
COMP_PORT_NOT_LEARNED	C0021	This monitor checks if: Set if Comp Port Learn has not done or the learned value is out of range	Read the NVRAM Comp port block. If == 0x00 then set this fault	CompPortNvram.LearnedStatus != 0x01	Run Comp Port Learn again and clear code	5 msec	Type A. MIL Illumination.
ACU_NOT_CONFIGURED	C0021	This monitor checks if: Set if EOL sensor Learn or Comp Port Learn has not done or failed	Read DID 46, if DID 46 == 0F 00, clear the fault, otherwise, set the fault	If DID 46 != 0F00	Learn all EOL sensor, and comp port learn again and clear code	5 msec	Type A. MIL Illumination.
ACU_SIM_TEST_PRESSURE_LOW_ERROR	C055F	This monitor checks if: Leaky Simulator Test Valve Leaky Pedal Simulator Valve Failed seals of Pedal Simulator piston Broken Pedal simulator piston spring	The Primary 3-way valve is de-energized and DAP is commanded to a certain position with the STV energized and Secondary 3-way valve. DAP stops its travel as soon as the Secondary Pressure sensor records a pressure of 30 bar. After the hold time, the pedal simulator valve is energized to let the fluid into the simulator and once again the DAP is commanded to a position until the secondary pressure reaches 20 bar. Then the DAP goes into a passive mode and then the pressure is monitored. If the pressure falls below 15 bar, this fault is set	Pressure recorded by the Secondary Pressure Sensor falls below 15 bar during this stage	Runs During Shutdown	5 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ACU_SIM_FILL_DELTA_POS_FAILURE	C055F	This monitor checks if: Blocked Pedal Simulator Valve Incompressible pedal simulator spring	The Primary 3-way valve is de-energized and DAP is commanded to a certain position with the STV energized and Secondary 3-way valve. DAP stops its travel as soon as the Secondary Pressure sensor records a pressure of 30 bar. After the hold time, the pedal simulator valve is energized to let the fluid into the simulator and once again the DAP is commanded to a position until the secondary pressure reaches 20 bar. If the position change is too small and the expected pressure is achieved, this fault is set	The secondary MC pressure shoots up to 20 bar with very little (5 millimeter) travel of the DAP	Runs During Shutdown	5 msec	Type A. MIL Illumination.
ACU_3WAY_OFF_LEAKAGE_ERROR	C05B0	This monitor checks if: Leaky LF Dump valve Leaky RF Dump valve Leaky LR Dump valve Leaky RR Dump valve LF Channel jounce hose leak RF Channel jounce hose leak LR channel jounce hose leak RR channel jounce hose leak	The Primary 3-way valve is de-energized and DAP is commanded to a certain position with the STV energized and Secondary 3-way valve. DAP stops its travel as soon as the Secondary Pressure sensor records a pressure of 30 bar. After the hold time, the pedal simulator valve is energized to let the fluid into the simulator and once again the DAP is commanded to a position until the secondary pressure reaches 20 bar. And then, the PSV, and both the 3-way valves are deenergized and this lets the fluid to the wheel ends. If the resultant secondary MC pressure drops below 15 bar, this fault is set.	The secondary MC pressure drops below 15 bar during this stage	Runs During Shutdown	5 msec	Type A. MIL Illumination.
ACU_CIRCUIT_FLOW_RATE_ERROR	C055F	This monitor checks if: Incompressible Master Cylinder pistons (Cannot be moved or limited movement)	All Dump valves are actuated for 200 ms (X4 times) to monitor the drop in pressure of the Secondary MC pressure sensor and if the pressure falls too slow compared to the calibration based pressure decay rate, this fault is set	The secondary circuit pressure drops too slow when all the four Dump valves are actuated	Runs During Shutdown	5 msec	Type A. MIL Illumination.
HYDRAULIC_SHUTDOWN_TEST_HAS_NOT_RUN	C0021	This monitor checks if: Shutdown test couldn't be completed from the past <TBD> miles or <TBD> ignition cycles.	Shutdown Test is usually run at the end of every ignition cycle and if the shutdown test gets aborted due to any reason, after <TBD> miles or 10 ignition cycles (whichever occurs first), this fault is set	Shutdown test couldn't be completed from the past <TBD> miles or 10 ignition cycles	Runs During Shutdown	5 msec	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
HYDRAULIC_SHUTDOWN_TEST_NOT_RUN_WARNING	C0021	This monitor checks if: Shutdown test couldn't be completed because the Pedal Travel Sensors detected a pedal travel <or> the ignition was turned ON	Shutdown Test is usually run at the end of every ignition cycle and if the shutdown test gets aborted due to any reason like the Pedal Travel Sensors detected a pedal travel <or> the ignition was turned ON, this fault is set	Shutdown test couldn't be completed because the Pedal Travel Sensors detected a pedal travel <or> the ignition was turned ON	Runs During Shutdown	5 msec	Type A. MIL Illumination.
BRAKE_BY_WIRE_HIGH_LEVEL_MONITOR_FAILURE	C0021	This monitor checks if: Base brake values are energized in a boosted brake mode, while there are any parts of the boost logic which indicate that boosted brakes should not be enabled.	The goal of this fault monitor is to look for conditions where the base brake values are energized in a boosted brake mode, while there are any parts of the boost logic which indicate that boosted brakes should not be enabled. The validity of the driver inputs, base brake mode, Actuator control mode, Boost/Brake Arbitrator states, and the Electric drive states must all agree that boosted brakes are allowed for the base brake valves to be in a boosted condition. Otherwise the fault will be matured.	• (Pedal Travel signal is not valid AND SCP is invalid) OR • Boost Arb targeted pressure is not available OR • BOOST System in INHIBITED OR • Electric Drive state is not active or not running OR • Actuator Control is not allowed	• Pedal travel sensor signal • SCP value • Boost Arb state • Electric drive status	200 msec	Type A. MIL Illumination.
Group 27 - CAN Device							
CAN_0_BUS_OFF_COMMS_FAULT	U0073	This monitor checks if: • HS bus Shorted • CAN transceiver faulty	Can peripheral locks for the bit errors in transmitted messages and increments txerror counter if any error is detected	if txerror counter reaches 256 and doesn't transmit any message for the fault maturation time.	• When wake lines are enabled. • Node supervisor is in enabled state	175 msec	Type C, No MIL, "Emissions Neutral Diagnostic "
CAN_0_LIST_INIT_TIMEOUT_COMMS_FAULT	U3000	This monitor checks if: • CAN hardware initialization failure	When time taken to initialize the message object exceeds the configured time out	Message object initilization timeout has occurred.	None	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
CAN_1_BUS_OFF_COMMS_FAULT	U0077	This monitor checks if: • CE bus Shorted • CAN transceiver faulty	CAN peripheral locks for the bit errors in transmitted messages and increments Tx error counter if any error is detected. if Tx error counter reaches 256 the fault get set.	if txerror counter reaches 256 and doesn't transmit any message for the fault maturation time.	• When wake lines are enabled. • Node supervisor is in enabled state	175 msec	Type C, No MIL, "Emissions Neutral Diagnostic "
CAN_1_LIST_INIT_TIMEOUT_COMMS_FAULT	U3000	This monitor checks if: • CAN hardware initialization failure	When time taken to initialize the message object exceeds the configured time out	Message object initilization timeout has occurred.	None	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
Group 28 - CAN Communication							

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MISSING_PPEI_POWERTRAIN_CONFIG_DATA	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 2.5 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	2.5 sec	Type B. MIL Illumination.
MISSING_PPEI_ENGINE_GENERAL_STATUS_4	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 1.25 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1.25 sec	Type B. MIL Illumination.
MISSING_PPEI_ENGINE_TORQUE_STATUS_3	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_PPEI_TRANS_GENERAL_STATUS_2	U0101	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_PPEI_PLATFORM_GENERAL_STATUS	U0140	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .25 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MISSING_PPEI_TORQUE_REQUEST_STATUS	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
GMLAN_ABA_ACT_POS_PROT_FAULT	U0401	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the protection value with every new received frame. An incorrect protection value will activate the fault.	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
GMLAN_ABA_ACT_POS_ARC_FAULT	U0401	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the ARC value with every new received frame. An incorrect alive rolling count value will activate the fault. Alive Rolling Count Sliding Window Fault Threshold is 3 out 16	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
MISSING_PPEI_ENGINE_TORQUE_STATUS_2	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
GMLAN_ENGTRQ_FSTAT_TRQ_FAIL	C2A07	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked.	EngTrqRdFlrSt == 0x1 OR EngTrqRdFlrSt == 0x2 OR EngTrqRdFlrSt ==0x4	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
GMLAN_ENGTRQ_FSTAT_ABOVE_RANGE	U0401	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• COMMS Message must be received. When correct message is received by EBCM, it is unpacked and pertinent signals are checked for a range error.	EngTrqRdFlrSt >= 5	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 Count	Type C, No MIL, "Emissions Neutral Diagnostic "
MISSING_PPEI_TRANS_GENERAL_STATUS_1	U0101	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_ETEI_TRANSMISSION_GENERAL_STATUS	U0101	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_PPEI_ENGINE_GENERAL_STATUS_1	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
GMLAN_ENG_SPEED_STAT_ABOVE_RANGE	U0401	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• COMMS Message must be received. When correct message is received by EBCM, it is unpacked and pertinent signals are checked for a range error.	EngSpdStat_0 == 0x02	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 Count	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MISSING_PPEI_CGM_GENERAL_STATUS_HS	U0146	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring Problem at message receiving module	The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type A. MIL Illumination.
MISSING_PPEI_HYBRID_GENERAL_STATUS_3_HS	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring Problem at message receiving module	The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_PPEI_TRANS_GENERAL_STATUS_4_HS	U0101	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring Problem at message receiving module	The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_PRFRMNC_TRCTN_CNTRL_ENG_STAT_HS	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring Problem at message receiving module	The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for 250 msec OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	250 msec	Type B. MIL Illumination.
MISSING_PPEI_STEERING_WHEEL_ANGLE_CE	U0131	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .025 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	30 msec	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
SWA_CHECKSUM_FAULT	U0420	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the checksum value with every new received frame. An incorrect checksum value will activate the fault.	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
SWA_ARC_FAULT	U0420	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the ARC value with every new received frame. An incorrect alive rolling count value will activate the fault. Alive Rolling Count Sliding Window Fault Threshold is 3 out 16	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
MISSING_IMU_YAW_LONG_ACC_CE	U0151	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .025 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	.25 sec	Type C, No MIL, "Emissions Neutral Diagnostic "
INERTIAL_DATA_RED_CHECKSUM_FAULT	U0452	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the checksum value with every new received frame. An incorrect checksum value will activate the fault.	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
INERTIAL_DATA_RED_ARC_FAULT	U0452	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the ARC value with every new received frame. An incorrect alive rolling count value will activate the fault. Alive Rolling Count Sliding Window Fault Threshold is 3 out 16	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
LONG_ACCEL_NOT_AVAILABLE	U0452	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• When the incoming message is unpacked, the signal will be checked immediately.	IMULonAccPriAval == 0x0	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 Count	Type C, No MIL, "Emissions Neutral Diagnostic "
MISSING_IMU_YAW_LATITUD_ACC_CE	U0151	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .025 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	.25 sec	Type C, No MIL, "Emissions Neutral Diagnostic "
INERTIAL_DATA_CHECKSUM_FAULT	U0452	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the checksum value with every new received frame. An incorrect checksum value will activate the fault.	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
INERTIAL_DATA_ARC_FAULT	U0452	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the ARC value with every new received frame. An incorrect alive rolling count value will activate the fault. Alive Rolling Count Sliding Window Fault Threshold is 3 out 16	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	1 count	Type C, No MIL, "Emissions Neutral Diagnostic "
BODY_INFORMATION_HS_ARC_FAULT	U0422	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	This fault is for TCSysDisSwAtvARC signal in $12A frame for Body control Module.• The EBCM is monitoring all relevant signals of the messages that are received and unpacked. • Alive Rolling Count and Protection Value Errors will be detected according to GMW8772.	The receiver shall check the ARC value with every new received frame. An incorrect alive rolling count value will activate the fault. Alive Rolling Count Sliding Window Fault Threshold is 3 out 16	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	N/A	Type C, No MIL, "Emissions Neutral Diagnostic "

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
MISSING_PPEI_DRV_PREF_MODE_SWITCH_STATUS	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .25 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	.25 sec	Type B. MIL Illumination.
MISSING_PPEI_ENGINE_GENERAL_STATUS_6	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .25 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	.25 sec	Type B. MIL Illumination.
MISSING_ETRS_GENERAL_REQUEST_2_HS	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .25 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	.25 sec	Type B. MIL Illumination.
MISSING_PPEI_PROPULSION_GEN_STAT_1_HS	U0100	This monitor checks if: • Problem at signal source • Problem at message source module • Problem with bus wiring • Problem at message receiving module	• The EBCM is monitoring the CAN bus for this message and checks if the message was received in the detection time.	Message missing for .25 seconds OR Message length is less than defined by DBC	• Fault will not be set during the following conditions: • within the first 2 seconds after System Power Mode has transitioned to RUN or OFF • Supply Voltage is less than 9V • CAN Bus Off Failure is detecting or latched • System Power Mode is in crank mode.	.25 sec	Type B. MIL Illumination.
Group 33 - Electronic Park Brake							
PB_MICRO_ADC_REFERENCE_FAULT	C0616	This monitor checks if: ECU internal defect. Incorrect 5V supply from ASIC.	The conversion of all input voltages on the S12 micro is based on an ADC reference voltage. This fault indicates this voltage is outside of expected tolerance so none of the voltage readings can be considered accurate.	The EPB Micro fault flag PB_MICRO_ADC_REFERENCE_FAULT = True	Filtered system voltage >= 7.5V AND SYSTEM_VOLTAGE_EXCESSIVE_LOW fault not set.	50 msec	Type A. MIL Illumination.
Group 38 - Systematic Errors							

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
TASK_OVERRUN_CORE0	P0606	This monitor checks if: Software Error ECU Hardware Failure Input Signals To ECU causing high interrupt load	A timer alarm used to activate a periodic task expires and the prior activation/execution of this task has not run to completion. The number of multiple activations allowed for the task has already been reached.	None	Always Enabled	9 counts	Type A. MIL Illumination.
TASK_OVERRUN_CORE1	P0606	This monitor checks if: Software Error ECU Hardware Failure Input Signals To ECU causing high interrupt load	A timer alarm used to activate a periodic task expires and the prior activation/execution of this task has not run to completion. The number of multiple activations allowed for the task has already been reached.	None	Always Enabled	9 counts	Type A. MIL Illumination.
TASK_OVERRUN_CORE2	P0606	This monitor checks if: Software Error ECU Hardware Failure Input Signals To ECU causing high interrupt load	A timer alarm used to activate a periodic task expires and the prior activation/execution of this task has not run to completion. The number of multiple activations allowed for the task has already been reached.	None	Always Enabled	9 counts	Type A. MIL Illumination.
MPU_FAULT_TRW_SCS_CORE0	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	Memory Protection Unit (MPU) detects an attempted memory access where there is no defined address range providing the needed permission.	None	Always Enabled	10	Type A. MIL Illumination.
MPU_FAULT_TRW_SCS_CORE1	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	Memory Protection Unit (MPU) detects an attempted memory access where there is no defined address range providing the needed permission.	None	Always Enabled	10	Type A. MIL Illumination.
MPU_FAULT_TRW_SCS_CORE2	P0606	This monitor checks if: Software Error Partial Microcontroller Failure	Memory Protection Unit (MPU) detects an attempted memory access where there is no defined address range providing the needed permission.	None	Always Enabled	10	Type A. MIL Illumination.
ICC_FAILURE_CORE0	P0606	This monitor checks if: ICC send or receive have been skipped.	ICC failsafe mechanism determines if any ICC receives or sends were skipped. At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot. In case it was skipped the failsafe matures the ICC fault. The failsafe also tries to get back the ICC receives and sends to work normally from the next 10ms Slot.	At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot.	Always Enabled	60	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter and Enable Condition	Time Required	MIL Illumination
ICC_FAILURE_CORE1	P0606	This monitor checks if: ICC send or receive have been skipped.	ICC failsafe mechanism determines if any ICC receives or sends were skipped. At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot. In case it was skipped the failsafe matures the ICC fault. The failsafe also tries to get back the ICC receives and sends to work normally from the next 10ms Slot.	At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot.	Always Enabled	60	Type A. MIL Illumination.
ICC_FAILURE_CORE2	P0606	This monitor checks if: ICC send or receive have been skipped.	ICC failsafe mechanism determines if any ICC receives or sends were skipped. At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot. In case it was skipped the failsafe matures the ICC fault. The failsafe also tries to get back the ICC receives and sends to work normally from the next 10ms Slot.	At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot.	Always Enabled	60	Type A. MIL Illumination.
ICC_FAILURE_CORE2	P0606	ICC failsafe mechanism determines if any ICC receives or sends were skipped. At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot. In case it was skipped the failsafe matures the ICC fault. The failsafe also tries to get back the ICC receives and sends to work normally from the next 10ms Slot.	ICC send or receive have been skipped.	At the beginning of every 10ms slot, every core in the scheduler runs the failsafe that checks if any of the ICC sends or receives were skipped in the previous 10ms slot.	Always Enabled	60	Type A. MIL Illumination.

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
Brake Booster Internal Power Driver									
Brake Booster Internal Power Driver Range/Performance	C0595	This monitoring checks if the B6 Bridge Driver ASIC does not answer properly to the uC test during initialization.	B6 Bridge Driver ASIC is not fault free during the initial test	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks the B6 Bridge Driver ASIC during operational mode and short circuits bits of B6 bridge MOSFETS.	B6 Bridge Driver ASIC is not fault free during the operational mode OR ASIC is not in valid operation mode OR MOSFET Short circuit failure bit is set	= True = True = True	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if the voltage drops at actuated MOSFET is too high.	Voltage drops at actuated MOSFET	> -210 [mV]	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the electric motor is temporarily unavailable due to re-initialization of Bridge Driver.	Electric motor is temporarily unavailable due to re-initialization of Bridge Driver	= True	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if load dump occurred in the system.	Load dump occurred	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if timeout occurred during motor initial test.	Initial motor tests are not finished within time	= 0.5 [s]	Ignition state	= On	0.500 [s]	Once	Type A, 1 Trip
Brake Booster Motor "A" Phase U-V-W Circuit Range/Performance	C0582	This monitoring checks if the measured voltage on an idle MOSFET is not in mid-level.	The measured voltage on an idle MOSFET is not in mid-level	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if MOSFETs of Bridge Driver can be controlled and actuated properly.	BMS_MON to UBB Ratio is less than 80 [%] when BMS is switched ON OR BMS_MON to UB6 Ratio is less than 80 [%] when BMS_RVP is switched ON OR BMS_MON is greater than 3.5 [V] when BMS is switched ON OR BMS_MON to UB6 Ratio is less than 80 [%] when BMS_RVP is switched ON	= True = True = True = True	Ignition state	= On	5 [s]	Once	Type A, 1 Trip
ke Pedal Position Sensor A									
Brake Master Cylinder Piston Position Sensor "A" Circuit Range/Performance	C05CC	This monitoring checks if the offset of channel 1 of the Pedal Travel Sensor is out of defined range.	Push rod stroke offset	> 0.9 [mm]	Ignition state AND PTS AND Brake Pedal AND Hydraulic Intervention EPS ACC AND Vehicle velocity AND Acceleration	= On = fault free = completely released = No intervention > Standstill (2 m/s) > 0	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is transmission error at SENT line.	SENT internal error code is received from sensor	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
Brake Master Cylinder Piston Position Sensor 1 Circuit High Voltage	C05CA	This monitoring checks if the Linear Position Sensor sends an 'Out of range high' failure information via the fast channel of the SENT protocol.	Out of range high' error message is transmitted	= True	Ignition state	= On	0.033 [s]	Continuous	Type A, 1 Trip
Brake Master Cylinder Piston Position Sensor 1 Circuit Low Voltage	C05CB	This monitoring checks if the Linear Position Sensor sends an 'Out of range low' failure information via the fast channel of the SENT protocol.	Out of range low' error message is transmitted	= True	Ignition state	= On	0.033 [s]	Continuous	Type A, 1 Trip
Brake Pedal Position / Accelerator Pedal Position Incompatible	P2299	This monitoring checks if the Pts signal is not zero in a released brake pedal position.	Offset compensated PTS signal for released brake pedal AND Brake pedal without any intervention from the driver	<> 0 = not released completely	Ignition state AND Vehicle speed AND Drive pedal is applied Signal is available and valid	= On > 4.47 [mph] = True	0.120 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
Internal Communication Fault with Brake Master Cylinder Piston Position Sensor 1	C2A13	This monitoring checks if the ID of the Linear position sensor is received in time.	ID of the Linear position sensor is not received in time	= True	Ignition state	= On	0.500 [s]	Once	Type A, 1 Trip
		This monitoring checks if the SENT line is shorted to supply.	Digital signal stable line high value detected	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the SENT line is shorted to ground.	Digital signal stable line low value detected	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is transmission error on SENT line.	Transmission error on SENT line	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
Brake Pedal Position Sensor B									
Brake Master Cylinder Piston Position Sensor "A/B" Correlation	C05D0	This monitoring checks whether the difference between PTS1 and PTS2 signal is too high.	|PTS1 signal - PTS2 signal|	> 2.71 [mm]	Ignition state AND Sensor Channel 1 and Channel 2 AND Sensor Channel 1 and Channel 2	= On = initialized = fault free	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the PTS signal is not zero in a released brake pedal position.	Offset compensated PTS signal for released brake pedal AND Brake pedal without any intervention from the driver	<> 0 = not released completely	Ignition state AND Vehicle speed AND Drive pedal is applied Signal is available and valid	= On > 4.47 [mph] = True	0.120 [s]	Continuous	Type A, 1 Trip
Brake Master Cylinder Piston Position Sensor "B" Circuit Range/Performance	C05CF	This monitoring checks if the offset of channel 2 of the Pedal Travel Sensor is out of defined range	Push rod stroke offset	> 0.9 [mm]	Ignition state AND PTS AND Brake Pedal AND Hydraulic Intervention EPS ACC AND Vehicle velocity AND Acceleration	= On = fault free = completely released = No intervention > Standstill (2 m/s) > 0	0.100 [s]	Continuous	Type A, 1 Trip
Brake Master Cylinder Piston Position Sensor "B" Circuit Voltage High	C05CD	This monitoring checks if the PWM line is shorted to supply.	Digital signal stable line high value detected	= True	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
Brake Master Cylinder Piston Position Sensor "B" Circuit Voltage Low	C05CE	This monitoring checks if the PWM line is shorted to ground.	Digital signal stable line low value detected	= True	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
Internal Communication Fault with Brake Master Cylinder Piston Position Sensor 2	C2A14	This monitoring checks if there is transmission error at PWM line.	PWM frequency OR PWM frequency OR PWM duty OR PWM duty	< 900 [Hz] > 1120 [Hz] < 8.5 [%] > 92 [%]	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
Brake Pressure Sensor									
Brake Pressure Sensor "A" Range/Performance	C053D	This monitoring checks if the offset value of pressure sensor 2 is correct.	Offset value	> 12 [bar]	Ignition state AND Brake Pedal	= On = released	Immediately	Once	Type A, 1 Trip
Brake Pressure Sensor "C" Circuit Range/Performance	C0574	This monitoring checks if there is transmission error at SENT line.	SENT internal error code is received from sensor	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
Internal Communication Failure with Pressure Sensor 2	C2A16	This monitoring checks if the SENT line is shorted to supply, open or the ground is interrupted.	Digital signal stable line high value detected	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if the SENT line is shorted to ground or the sensor supply is interrupted.	Digital signal stable line low value detected	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is transmission error on SENT line.	Transmission error on SENT line	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
Brake System Plunger Motor									
Brake Booster Motor "A" Over Temperature	C05C2	This monitoring checks if the rotor or ECU temperature is higher than a defined level.	ECU temperature	> 120 [°C]	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if the rotor or ECU temperature is higher than a defined level.	ECU temperature	> 142 [°C]	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
Brake Booster Motor "A" Performance	C0594	This monitoring checks if the plunger can reach the mechanical backward bound.	Plunger travel	> Plunger length	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if motor test detects hardware failure.	Motor test detects HW failure	= True	Ignition state AND Motor is actuated	= On = False	0.010 [s]	Cyclically in every 20 [s]	Type A, 1 Trip
		This monitoring checks if the motor movement is sufficient according to the expected pressure value.	Pressure sensor 2 value AND Calculated pressure - Pressure sensor 2 value	= < 10 [bar] > 40 [bar]	Ignition state	= On	0.015 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the motor movement is sufficient according to the expected pressure value.	Calculated pressure - Pressure sensor 2 value OR Pressure sensor 2 value - Calculated pressure	> 40 [bar] > 108 [bar]	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
Brake Booster Motor "A" Phase U-V-W Circuit/Open	C057F	This monitoring checks the motor coil resistance value.	Measured motor coil resistance	> 0.20358 [Ohm]	Ignition state	= On	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the motor coil resistance value.	Measured motor coil resistance	< 0.01258 [Ohm]	Ignition state	= On	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the voltage vector is plausible.	Actual voltage vector - Calculated voltage vector	> 1.5 [V]	Ignition state	= On	0.020 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the UB6 to UBB ratio is out of a defined range.	UB6/UBB ratio OR UB6/UBB ratio	< 75 [%] > 125 [%]	Ignition state AND Motor is actuated	= On = False	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a hard undervoltage measured at UBB main supply line.	UB6 voltage AND UBB-UB6 voltage	< 3 [V] > 1 [V]	Ignition state AND Motor is actuated	= On = True	0.200 [s]	Continuous	Type A, 1 Trip
Brake Booster Motor "A" Phase U-V-W Current High	C0590	This monitoring checks the offset (current value during no actuation) of the motor current measurement.	Current during idle mode	> 36.1 [A]	Ignition state AND Motor is actuated	= On = False	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the offset (current value during no actuation) of the motor current measurement.	Current during idle mode	> 0 [A]	Ignition state AND Motor is actuated	= On = False	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks that the motor current is not clamping at high threshold.	Phase Current 1	> 200 [A]	Ignition state	= On	0.300 [s]	Continuous	Type A, 1 Trip
		This monitoring checks that the motor current is not clamping at high threshold.	Phase Current 2	> 200 [A]	Ignition state	= On	0.300 [s]	Continuous	Type A, 1 Trip
Brake Booster Motor "A" Phase U-V-W Current Low	C0591	This monitoring checks the offset (current value during no actuation) of the motor current measurement.	Current during idle mode	< 0 [A]	Ignition state AND Motor is actuated	= On = False	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the offset (current value during no actuation) of the motor current measurement.	Current during idle mode	< -36.1 [A]	Ignition state AND Motor is actuated	= On = False	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks that the motor current is not clamping at low threshold.	Phase Current 1	< -200 [A]	Ignition state	= On	0.300 [s]	Continuous	Type A, 1 Trip
		This monitoring checks that the motor current is not clamping at low threshold.	Phase Current 2	< -200 [A]	Ignition state	= On	0.300 [s]	Continuous	Type A, 1 Trip
Brake System Plunger Motor Position Sensor									
Brake Booster Motor "A" Position Sensor Circuit High	C0589	This monitoring checks if the RPS cosine signal is out of range high.	Raw Cos ADC Value (Cos+ or Cos-) OR Sum Raw Cos ADC Values (Cos+ and Cos-)	> 2795 > 4327	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the RPS Sinus signal is out of range high.	Raw Sin ADC Value (Sin+ or Sin-) OR Sum Raw Sin ADC Values (Sin+ and Sin-)	> 2795 > 4327	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip
Brake Booster Motor "A" Position Sensor	C0588	This monitoring checks if the RPS cosine signal is out of range low.	Raw Cos ADC Value (Cos+ or Cos-) OR	< 1300	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
Circuit Low			Sum Raw Cos ADC Values (Cos+ and Cos-)	< 3876					
		This monitoring checks if the RPS Sinus signal is out of range low.	Raw Sin ADC Value (Sin+ or Sin-) OR Sum Raw Sin ADC Values (Sin+ and Sin-)	< 1300 < 3876	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip
Brake Booster Motor "A" Position Sensor Circuit Range/Performance	C058A	This monitoring checks if there is a noise in the RPS vector length.	Oscillation of vector	>= 0.1025	Ignition state AND Motor is actuated	= On = True	0.015 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the vector length value of RPS is out of range high	Calculated vector length (sin^2+cos^2)	> 1.2996	Ignition state AND Motor is actuated	= On = True	0.010 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the vector length value of RPS is out of range low.	Calculated vector length (sin^2+cos^2)	< 0.6889	Ignition state AND Motor is actuated	= On = True	0.010 [s]	Continuous	Type A, 1 Trip
CAN Bus A									
Control Module Communication Bus "A" Off	U0073	This monitoring checks if the CAN controller is in a Bus Off state.	BusOff status has been detected	= True	Ignition state	= On	0.240 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a timeout failure caused by HW-Error.	Expected action has not occurred within its allowed time	= True	Ignition state AND A CAN controller request has been issued	= On = True	Immediately	Continuous	Type A, 1 Trip
Lost Communication With ECM/PCM "A"	U0100	This monitoring checks if the message ETRS_General_Request_2_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.25 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Drv_Pref_Mode_Switch_Status_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Engine_General_Status_1_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Engine_General_Status_4_HS from ECM_HS is received within a time range.	Message is not received for time	> 1.250 [s]	Communication related conditions are fulfilled	= True	1.25 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Engine_General_Status_6_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Engine_Torque_Status_2_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Engine_Torque_Status_3_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Propulsion_Gen_Stat_1_HS from HCP_HS/ ECM_HS/ BCP_HS/ HCP_B_HS/ HCP_T_HS is received within a time range.	Message is not received for time	> 0.500 [s]	Communication related conditions are fulfilled	= True	0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Propulsion_Sys_Gen_Status from ECM_HS is received within a time range.	Message is not received for time	> 1.250 [s]	Communication related conditions are fulfilled	= True	1.25 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Torque_Request_Status_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.250 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Trans_General_Status_2_HS from ECM_HS is received within a time range.	Message is not received for time	> 0.500 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.500 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if the message PPEI_Vehicle_Speed_and_Distance_HS from ECM_HS is received within a time range.	Message is not received for time	> 2.5 [s]	Communication related conditions are fulfilled	= True	2.5 [s]	Continuous	Type A, 1 Trip
Lost Communication With TCM	U0101	This monitoring checks if the message PPEI_Trans_General_Status_2_HS from TCM_HS is received within a time range.	Message is not received for time	> 0.5 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the message PPEI_Transmission_Otpt_Rot_Stat_HS from TCM_HS/ HCP_T_HS is received within a time range.	Message is not received for time	> 0.25 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type A, 1 Trip
CAN Bus E									
Control Module Communication Bus "E" Off	U0077	This monitoring checks if the CAN controller is in a Bus Off state.	BusOff status has been detected	= True	Ignition state	= On	0.090 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a timeout failure caused by HW-Error.	Expected action has not occurred within its allowed time	= True	Ignition state AND A CAN controller request has been issued	= On = True	Immediately	Continuous	Type A, 1 Trip
Controller									
ABS Valves Supply Voltage Circuit/Open	C053B	This monitoring checks if the VLV Supply line is able to drive an actuation.	Resistivity of valve path supply line	> 3 [Ohm]	Ignition state AND Vehicle speed AND Brake Pedal	= On > 9.32 [mph] = not actuated	20 [s]	Once	Type A, 1 Trip
		This monitoring checks if the voltage is high enough for initial valve relay switch-on test.	UVR	> 4.6 [V]	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if the VLV Supply line is able to drive an actuation.	Resistivity of valve path supply line	> 3 [Ohm]	Ignition state AND Vehicle speed AND Brake Pedal	= On > 9.32 [mph] = not actuated	20 [s]	Once	Type A, 1 Trip
		This monitoring checks if the voltage is high enough for initial valve relay switch-on test.	UVR	< 4.6 [V]	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
Brake Bleed Not Complete	C15C7	This monitoring checks if the IPB is in assembly mode during initialization or diagnosis.	NVM item for 'IPB Assembly Mode' is set	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
Brake Booster Motor "A" Phase U-V-W Circuit Range/Performance	C0582	This monitoring checks if the two sensor voltages have plausible values.	(Sum of the BLM Temperature Signal 1 and Signal 2 OR Sum of the BLM Temperature Signal 1 and Signal 2) AND Times implausible values detected)	> 3.43 [V] < 2 [V] >= 2	Ignition state	= On	0.600 [s]	Continuous	Type A, 1 Trip
Brake System Plunger Motor Position Sensor Not Learned	C2A1C	This monitoring checks the consistency between the version of the RPS calibration data and the version in SW.	Inconsistency between RPS calibration data version and SW version	= True	IPB State	= Init phase	immediately	Once	Type A, 1 Trip
Control Module	U3000	This monitoring checks if assertion failed error occurred according to the ANSI C standard at SW development.	Assertion failed	= True	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if the test of the charge pump has detected a failure.	Charge Pump test failed	= True	Ignition state	= On	Immediately	Cyclically in every 19 [s]	Type A, 1 Trip
		This monitoring checks if there is DMA transfer error due to timeouts.	Transfer error occurred during DMA transfer	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the reference voltage of the ADC is in a proper range.	ADC reference voltage OR ADC reference voltage	< 1.145 [V] > 1.345 [V]	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if MRG path is working.	MRG path test fails	= True	Ignition state	= On	0.080 [s]	Once	Type A, 1 Trip
		This monitoring checks if the system chip internal decouple bits are reset within the expected time.	Decouple bit is reset	= False	Ignition state	= On	0.080 [s]	Once	Type A, 1 Trip
		This monitoring checks if the BIST can switch off electrically if wrong BIST commands received.	BIST did not switch off electrically after 3 wrong BIST commands	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if ClockIn monitor works properly (test of test).	ClockIn failure status is not as expected	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the ECU electrical enable line can be switched ON by the software.	ECU internal electrical enable line has a short to ground OR The ECU internal electrical enable line cannot be switched ON by the software	= True = True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the ECU electrical enable line can be switched OFF by the software.	ECU internal electrical enable line has a short to supply voltage OR The ECU internal electrical enable line cannot be switched OFF by the software	= True = True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the ECU internal hydraulic enable line can be switched ON by the software.	ECU internal hydraulic enable line has a short to ground OR The ECU internal hydraulic enable line cannot be switched ON by the software	= True = True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the ECU internal hydraulic enable line can be switched OFF by the software.	ECU internal hydraulic enable line has a short to supply voltage OR The ECU internal hydraulic enable line cannot be switched OFF by the software	= True = True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the enable line is set properly.	Missing low level enable signal of ECU internal hydraulic line is detected for time OR Missing low level enable signal of ECU internal electrical line is detected for time	> 0.05 [s] > 0.05 [s]	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the enable line is set properly (second ASIC).	Missing low level enable signal of ECU internal hydraulic line is detected for time OR Missing low level enable signal of ECU internal electrical line is detected for time	> 0.05 [s] > 0.05 [s]	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Errorpin event counter works properly.	Errorpin event counter does not increment on error pin event	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if a missing watchdog trigger causes hydraulic/electric shutdown.	Missing BIST trigger does not switch off hydraulic/electrical path	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks whether the system chip switches off the gate actuation when it detects a missing watchdog trigger.	Valve relay gate is not switched off due to missing watchdog trigger	= True	Ignition state AND Fail-safe logic test is running	= On = True	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if the valve relay gate actuation is properly switched off via a Serial Peripheral Interface (SPI) command during the Fail-Safe Logic Test.	Valve relay gate is not switched off via SPI	= True	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks the status of the watchdog at initialization state.	Watchdog status differs from the expected status	= True	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks the status of the watchdog.	Watchdog status differs from the expected status	= True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the status of the watchdog (second ASIC).	Watchdog status differs from the expected status	= True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the watchdog BIST state machine can detect a wrong BIST command value.	Watchdog of the system chip is triggered by a wrong BIST command value	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if a switched on valve relay is reported as off (system chip internal status).	Valve relay gate does not switch on (or simply the feedback of system chip is wrong)	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the GTM time base which is used for e.g. WSS works properly.	Reference frequency from system ASIC OR Reference frequency from system ASIC	< 3.8 [kHz] > 4.2 [kHz]	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the 4 kHz reference frequency signal from system ASIC is in correct range.	Obtained frequency signal from system ASIC OR Obtained frequency signal from system ASIC	< 3.8 [kHz] > 4.2 [kHz]	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if System ASIC CLKIN input signal is outside of the specified frequency range.	ASIC internal CLKIN failure bit is set	= True	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if System 2nd ASIC CLKIN input signal is outside of the specified frequency range.	ASIC internal CLKIN failure bit is set	= True	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the ASIC can detect the failure test frames and therefore set corresponding failure flags.	ASIC could not detect the failure frames	= True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the 2nd ASIC can detect the failure test frames and therefore set corresponding failure flags.	ASIC could not detect the failure frames	= True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the internal ASIC oscillator works properly.	ASIC SPI register bit for Oscillator failure is set to	= 1	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the internal 2nd ASIC oscillator works properly.	2nd ASIC SPI register bit for Oscillator failure is set to	= 1	Ignition state	= On	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the SPI communication with B6 Bridge Driver ASIC.	B6 Bridge Driver ASIC could detect failure frames via SPI	= False	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the SPI communication between ASIC and the microcontroller.	Length of received data does not match the length of sent data OR Calculated parity does not match the received parity bit OR Transmitted bit does not match bit in register OR Error frame is transmitted	= True = True = True = True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the SPI communication between 2nd ASIC and the microcontroller.	Length of received data does not match the length of sent data OR Calculated parity does not match the received parity bit OR Transmitted bit does not match bit in register OR Error frame is transmitted	= True = True = True = True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if U5V is out of range.	U5V undervoltage bit is set OR U5V overvoltage bit is set	= True = True	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks the ASIC internal test of the U5V voltage regulator.	U5V voltage comparator test did not finished in a defined timeslot	> 0.100 [s]	Ignition state	= On	0.100 [s]	Once	Type A, 1 Trip
		This monitoring checks if the voltage regulator configuration of the ASIC matches the software configuration.	Voltage regulator configuration of the ASIC does not match configuration in SW	= True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the ASIC internal current reference is out of range.	Current reference failure bit is set	= True	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a voltage divider drift failure (UB_RD_INT voltage).	Difference between UB_Valve and UB_RD_INT	> 3 [V]	Ignition state	= On	0.180 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the NMI mechanism is running properly.	No NMI occurred OR Not expected NMI occurred	= True = True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if tests of the safety logic of uC works as expected.	Microcontroller safety logic tests fail	= True	Ignition state	= On	immediately	Once	Type A, 1 Trip
		This monitoring checks if the supply voltage of the microcontroller is out of range.	Failure bit for microcontroller supply out of range is set	= True	Ignition state	= On	immediately	Continuous	Type A, 1 Trip
		This monitoring checks if the valve driver configuration was successful.	Valve driver configuration data read back from ASIC does not match the written data	= True	Ignition state	= On	0.015 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the valve driver configuration was successful.	Valve driver configuration data read back from ASIC does not match the written data	= True	Ignition state	= On	0.015 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if all Watchdog commands have been scheduled.	At least one WD trigger was not scheduled	= True	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if there is too many wrong watchdog trigger pattern are received by system ASIC.	Number of the received watchdog error	> 3	Ignition state	= On	0.040 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if the watchdog BIST state machine can detect a wrong BIST command value.	Watchdog of the system chip is triggered by a wrong BIST command value	= True	Ignition state	= On	0.030 [s]	Continuous	Type A, 1 Trip
		This monitoring checks line issues between ASIC and uC.	Wheel speed sensor signal and multiplexed wheel speed sensor signal are not identical	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					AND WSS Test has been finished AND Vehicle speed	 = True > 12.42 [mph]			
		This monitoring checks if System IC test does not work due to hardware malfunction.	WSS HW Test in System IC failed	= True	Ignition state	= On	0.015 [s]	Once	Type A, 1 Trip
Control Module Processor	P0606	This monitoring checks if a third party software access into restricted RAM area is detected	Restricted area was tried to be accessed by DMC	= True	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if the hardware components are supported by the software.	Device ID of ASIC is in the list of supported device IDs OR Software version ID of ASIC is in the list of supported software version IDs OR Microcontroller device ID is in the list of supported device IDs OR Microcontroller software version ID is in the list of supported SW version IDs	= False = False = False = False	Ignition state	= On	0.030 [s]	Once	Type A, 1 Trip
		This monitoring checks if there is a microcontroller exception.	Data abort occurred OR Pre-fetch abort occurred OR Undefined instruction occurred	= True = True = True	Ignition state	= On	immediately	Continuous	Type A, 1 Trip
		This monitoring checks that each task is activated and executed within its designated timeslot.	OS detects that a task was not activated in expected time OR OS detects that a task was not executed within its timeslot	= True = True	Ignition state	= On	It depends on the cycle time of the faulty	Continuous	Type A, 1 Trip
		This monitoring checks the error hooks (exceptions) occurring in the Operating System.	Software program execution failure is detected	= True	Ignition state	= On	immediately	Continuous	Type A, 1 Trip
		This monitoring checks if the microcontroller stack is not changed by other tasks.	Checkword at the beginning or end of stack has been overwritten	= True	Ignition state	= On	0.080 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if an interrupt fault has occurred.	Software interrupt occurred OR 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 [s]	Ignition state	= On	immediately	Continuous	Type A, 1 Trip
		This monitoring checks if there is a task runtime overload.	Jitter time of 5 msec task	> 5 [%]	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if there is an overload situation.	Task did not finish within its cycle time	= True	Ignition state	= On	immediately	Continuous	Type A, 1 Trip
		This monitoring checks if cyclically test execution of SVDT in hardware is not stopped.	Stop response from hardware does not work or the test is not stopped	= True	Ignition state	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks that the task system of the microcontroller and the one of the ASIC stay synchronized or at least get resynchronized again.	Resynchronization between task system of microcontroller and ASIC fails	= True	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if cyclically test execution of SVDT in hardware is not stopped.	Stop response from hardware does not work or the test is not stopped	= True	Ignition state	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks that the task system of the microcontroller and the one of the ASIC stay synchronized or at least get resynchronized again.	Resynchronization between task system of microcontroller and ASIC fails	= True	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks for UVR leakage current due to ohmic side circuit by Valve-Coil-Resistance-Measurement (VCRM) inside the	Leakage current (UVR leakage current comparator bit is set) OR UVR goes from 0 [V] over 1.26 [V] within	> 0.0063 [A] = 0.06 [s]	Ignition state	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks the valve-coil resistance measurement path by Valve-Coil-Resistance-Measurement (VCRM) inside the HSW.	Driver ASIC internal current source	<> 0.04 [A] +/-5 % (required source current)	Ignition state	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is short between	High ohmic short to GND bit in ASIC is set	= 1	Ignition state	= On	0.185 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		VR and GND.			AND Valve Relay is switched OFF	 = True			
		This monitoring checks if there is short between VR and GND.	Short to GND bit in ASIC is set to	= 1	Ignition state AND Valve Relay is switched OFF	= On = True	0.025 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the feedback of VRG actuation is plausible.	State of VRG Status via SPI does not fit to logical switch state	= True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched OFF.	Valve Relay can be switched OFF	= False	Ignition state	= On	0.065 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched OFF during the initial test.	Valve Relay can be switched OFF	= False	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched ON.	Valve Relay can be switched ON	= False	Ignition state AND Valve Relay is switched ON	= On = True	0.015 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched ON during the initial test.	Valve Relay can be switched ON	= False	Ignition state AND Valve Relay is switched ON	= On = True	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched OFF by redundant safety switch.	Valve Relay can be switched OFF by redundant safety switch	= False	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks for UVR leakage current due to ohmic side circuit by Valve-Coil-Resistance-Measurement (VCRM) inside the	Leakage current (UVR leakage current comparator bit is set) OR UVR goes from 0 [V] over 1.26 [V] within	> 0.0063 [A] = 0.06 [s]	Ignition state	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks the valve-coil resistance measurement path by Valve-Coil-Resistance-Measurement (VCRM) inside the HSW.	Driver ASIC internal current source	<> 0.04 [A] +/-5 % (required source current)	Ignition state	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is short between VR and GND.	High ohmic short to GND bit in ASIC is set	= 1	Ignition state AND Valve Relay is switched OFF	= On = True	0.185 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is short between VR and GND.	Short to GND bit in ASIC is set to	= 1	Ignition state AND Valve Relay is switched OFF	= On = True	0.025 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the feedback of VRG actuation is plausible.	State of VRG Status via SPI does not fit to logical switch state	= True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched OFF.	Valve Relay can be switched OFF	= False	Ignition state	= On	0.065 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched OFF during the initial test.	Valve Relay can be switched OFF	= False	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched ON.	Valve Relay can be switched ON	= False	Ignition state AND Valve Relay is switched ON	= On = True	0.015 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched ON during the initial test.	Valve Relay can be switched ON	= False	Ignition state AND Valve Relay is switched ON	= On = True	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if the Valve Relay can be switched OFF by redundant safety switch.	Valve Relay can be switched OFF by redundant safety switch	= False	Ignition state	= On	1 [s]	Once	Type A, 1 Trip
		This monitoring checks if Core 1 and Core 2 SW-BIST signatures are different.	Core 1 and Core 2 SW BIST signatures are different	= True	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the task scheme is proper.	A 5 ms task is not executed in every 5 ms	= True	Ignition state	= On	0.010 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the current wheel speed sensor configuration is correct via Serial Peripheral Interface (SPI).	Mismatch between current WSS Mode software configuration stored in a register and the hardware configuration	= True	Ignition state	= On	0.200 [s]	Once	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if the current wheel speed sensor configuration is correct via Serial Peripheral Interface (SPI).	Mismatch between current WSS Mode software configuration stored in a register and the hardware configuration	= True	Ignition state	= On	0.200 [s]	Once	Type A, 1 Trip
		This monitoring checks if the current wheel speed sensor configuration is correct via Serial Peripheral Interface (SPI).	Mismatch between current WSS Mode software configuration stored in a register and the hardware configuration	= True	Ignition state	= On	0.200 [s]	Once	Type A, 1 Trip
		This monitoring checks if the current wheel speed sensor configuration is correct via Serial Peripheral Interface (SPI).	Mismatch between current WSS Mode software configuration stored in a register and the hardware configuration	= True	Ignition state	= On	0.200 [s]	Once	Type A, 1 Trip
		This monitoring checks if ASW configuration takes too long.	ASW current states stay in initialized state	= True	Ignition state	= On	5 [s]	Continuous	Type A, 1 Trip
Control Module Programming Error	P0602	This monitoring checks if the ECU exchange was not proper.	Mismatch between the stored and the real LiPS ID	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the IPB has not been programmed with calibration data set.	5th Byte in internal customer data from any of the 5 pieces of calibration block	= ASCII 'D'	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the configuration of the wheel speed sensor type is possible.	Wheel speed sensor type value OR Wheel speed sensor type value OR NVM item is corrupted	> 29 < 0 = True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
EBCM Overtemperature	C127E	This monitoring checks if there is an overtemperature at the external power supply line in the direction of LiPS.	Overtemperature situation detected by system ASIC at external LiPS power supply line	= True	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
Internal Control Module A/D Processing Performance	P060B	This monitoring checks if there are general ADC errors of the operational conversion.	Parity error is registered OR ID error is registered OR Operational scan group has completed its conversion in time OR All operational results have been written before they are read	= True = True = False = False	Ignition state	= On	0.080 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there are open bonds or pins.	ADC open bond failure bit is set for number of times	>= 3	Ignition state	= On	0.080 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the converted internal test voltages are in a defined range.	ADC selftest failure bit is set for number of times	>= 3	Ignition state	= On	0.070 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if ADC register bits are set to the expected values.	An ADC register bit OR An ADC register bit	= is flipped = is stucked	Ignition state	= On	0.080 [s]	Continuous	Type A, 1 Trip
Internal Control Module EEPROM Error	P062F	This monitoring checks if LiPS-related NvM item can be written.	LiPS-related NvM item can not be written	= True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if there are too many read/write requests.	Number of read/write requests	> 100	Ignition state	= On	0.250 [s]	Continuous	Type A, 1 Trip
Internal Control Module Keep Alive Memory (KAM) Error	P0603	This monitoring checks if the NVM item for the front axle can be read or valid.	NVM item can be read OR NVM item is valid	= False = False	Ignition state AND Battery voltage	= On Is in range of 9..16 [V]	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the NVM item for the rear axle can be read or valid.	NVM item can be read OR NVM item is valid	= False = False	Ignition state AND Battery voltage	= On Is in range of 9..16 [V]	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the Linear position sensor related NVM item can be read, or the item is valid.	LiPS-related NvM item is empty OR LiPS-related NvM item is invalid	= True = True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks the write result at the end of the EEPROM write procedure.	Invalid cell result received during read back after writing to the EEPROM	= True	Ignition state	= On	0.020 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the gear ratio information can be read out from the non-volatile memory.	Gear ratio information can be read out from the NVM OR Gear ratio information is correct	= False = False	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the motor size information can be read out from the non-volatile memory.	Motor Size information can be read out from the NVM OR Motor Size information is correct	= False = False	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks if the NvM items: RPS_Offset, RPS_Rescalling, RPS_CorrAmplitudes and the RPS_Version are readable.	Offset read failure occurred OR Rescaling read failure occurred OR	= True = True	IPB State	= Init phase	immediately	Once	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Correction Amplitudes read failure occurred OR Version read failure occurred OR Orthogonality read failure occurred	= True = True = True					
Internal Control Module Memory Checksum Error	P0601	This monitoring checks proper functionality of Flash.	Uncorrectable Flash ECC fault occurred OR Number of Flash ECC correctable bit faults OR Flash checksum verification failed	= True > 3 = True	Ignition state	= On	0.080 [s]	Continuous	Type A, 1 Trip
Internal Control Module Random Access Memory (RAM) Error	P0604	This monitoring checks if the LBIST and MBIST are working properly.	Test result bits set do no match reference register value OR Signature register values do no match reference register value	= True = True	Ignition state	= On	Immediately	Once	Type A, 1 Trip
		This monitoring checks proper functionality of RAM.	Uncorrectable RAM ECC fault occurred OR Number of RAM ECC correctable bit faults OR Coupling between neighbouring RAM cells OR RAM addressing fault occurred	= True > 2 = True = True	Ignition state	= On	Immediately	Continuous	Type A, 1 Trip
System Voltage High	P0563	This monitoring checks if the power supply at valve path is too high.	UB_VR	> 16.5 [V]	Ignition state	= On	0.300 [s]	Continuous	Type B, 2 Trips
Electronic Parking Brake									
Control Module Processor	P0606	This monitoring checks if the PBC access to the actuators does not violate the rules.	PBC release access	> 10 [s]	Ignition state	= Off	10 [s]	Continuous	Type A, 1 Trip
			PBC lock access	> 30 [s]	Ignition state AND Vehicle speed	= On > 9.32 [mph]	30 [s]		
		This monitoring checks if the memory access area is correct.	PBC is accessing a forbidden memory area	= True	Ignition state AND PBC is active	= On = True	0.010 [s]	Continuous	Type A, 1 Trip
Internal Control Module Keep Alive Memory (KAM) Error	P0603	This monitoring checks if the Turn2Lock or Turn2Open actuation is influenced by an untreated memory (RAM/Flash) suspicion.	Motor actuation is influenced by untreated memory suspicion (e.g. RAM single-bit error, double bit-error).	= True	(Turn-to-Lock actuation is ongoing OR Turn-to-Open actuation is ongoing) AND Ignition state	= True = True = On	Immediately	Continuous	Type A, 1 Trip
Hydraulic Valves									
Brake Booster Performance	C0021	This monitoring checks if the pressure in plunger circuit is too low.	Target pressure AND Pressure sensor 2 value	> 60 [bar] < 30 [bar]	Ignition state AND Braking is requested (either by driver or by external)	= On = True	0.300 [s]	Continuous	Type A, 1 Trip
		This monitoring checks with goodcheck if the pressure in plunger circuit is too low.	Target pressure AND Pressure sensor 2 value	> 60 [bar] < 30 [bar]	Ignition state AND Braking is requested (either by driver or by external)	= On = True	0.300 [s]	Continuous	Type A, 1 Trip
Brake Hydraulic Circuit "C" Leak	C05B0	This monitoring checks if there is air in the plunger. It checks the system during three situation: - during replenishment (Replenishment air detection, RAD) - during TAD (Transition to idle air Detection, TAD) - active test after power on (FAD).	Calculated air volume (based on Pressure sensor 2 value and plunger position)	> 2 [cm^3]	BBF System state AND Replenishment is active	= Circuit separation OR One circuit = True	1.5 [s]	RAD: At each replenishment in degraded state. TAD: At each pressure based TTI in degraded state. FAD: At least once per power cycle.	Type A, 1 Trip
			Calculated air volume (based on Pressure sensor 2 value and plunger position)	> 1.5 [cm^3]	BBF System state AND TTI is active	= Circuit separation OR One circuit = True	5 [s]		
			Calculated air volume (based on Pressure sensor 2 value and plunger position)	> 1 [cm^3]	BBF System state AND	= Full OR Degraded pedal feel	10 [s]		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Braking is requested (either by driver or by external) AND Vehicle speed AND Pressure sensor 1 value	= False Is in range of 9.32..43.5 [mph] < 10 [bar]			
Brake Hydraulic Circuit Blocked	C12F9	This monitoring checks if circuit stiffness in the plunger circuit is too high.	Pressure sensor 2 value	> target pressure + 50 bar	BBF System state AND Braking is requested (either by driver or by external) AND Pressure sensor 2 value	= Backup = True > 3 [bar]	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if circuit stiffness in the plunger circuit is too high.	Pressure sensor 2 value	> target pressure + 50 bar	BBF System state AND Braking is requested (either by driver or by external) AND Pressure sensor 2 value	= Backup = True > 3 [bar]	0.100 [s]	Continuous	Type A, 1 Trip
Brake Hydraulic Circuit Excessive Compliance - Level 2	C2A20	This monitoring checks if there is a leakage in Circuit 1.	Calculated leakage based on pressure sensor 2 value	> 500 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external)	= Circuit separation = True	From 0.100 to 0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a leakage in Circuit 1.	Calculated leakage based on pressure sensor 2 value	> 500 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external)	= Circuit separation = True	From 0.100 to 0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a leakage in Circuit 2.	Calculated leakage based on pressure sensor 2 value	> 500 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external)	= Circuit separation = True	From 0.100 to 0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a leakage in Circuit 2.	Calculated leakage based on pressure sensor 2 value	> 500 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external)	= Circuit separation = True	From 0.100 to 0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a leak in the remaining single circuit.	Calculated leakage based on pressure sensor 2 value	> 500 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external)	= One circuit = True	From 0.100 to 0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a leak in the plunger circuit.	Calculated leakage based on pressure sensor 2 value	> 2000 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external)	= Full = True	From 0.100 to 0.500 [s]	Continuous	Type A, 1 Trip
Brake Master Cylinder Cut Off Valve	C05D5	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR	> 4 - 6.5 [A] > 195-220°C	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])					
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
Brake Pedal Feedback Pressure Solenoid Circuit	C0024	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 5 - 8 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 5 - 8 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 6.9 [Ohm] < 2.2 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR	= True	Ignition state AND	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True	Valve relay supply voltage AND Hydraulic request is set	> 6.9 [V] = False			
BSCM/EBBC Hydraulic Unit Performance	C055F	This monitoring checks if there is a leakage in the Master Cylinder.	Calculated leakage	> 200 [mm^3/s]	BBF System state AND Brake Pedal AND Pressure sensor 1 value	= Full = applied > 6 [bar]	Immediately	Continuous	Type A, 1 Trip
		This monitoring checks if brake boosting capability is lost.	Calculated air volume (based on Pressure sensor 2 value and plunger position) AND Calculated leakage	>= 8 [cm^3] > 500 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external) AND Vehicle speed	= Full OR Degraded pedal feel = True < 89.5 [mph]	4 [s]	Once	Type A, 1 Trip
		This monitoring checks if the pressure build capability is reduced.	Calculated air in plunger	Is in range of 3.5..8 [cm^3]	BBF System state AND Braking is requested (either by driver or by external) AND Vehicle speed	= Full OR Degraded pedal feel = False Is in range of 9.32..89.5 [mph]	8 [s]	Once	Type A, 1 Trip
		This monitoring checks if the pressure build capability is reduced.	Calculated leakage	> 200 [mm^3/s]	BBF System state AND Braking is requested (either by driver or by external) AND Vehicle speed	= Full OR Degraded pedal feel = True < 89.5 [mph]	4 [s]	Once	Type A, 1 Trip
		This monitoring checks if the pressure build up during replenishment is possible.	Pressure sensor 2 value gradient OR Plunger volume	< 300 [bar/s] > plunger volume at start of replenishment + 1 cm^3	Ignition state AND Replenishment is active	= On = True	0.200 [s]	Continuous	Type A, 1 Trip
Driver Applied Pressure Higher Than Expected	C05D3	This monitoring checks if the current pressure sensor value is too high for the current Pedal Travel Sensor value.	Pressure sensor value* OR Pedal Travel Sensor value	> too high < too low	Ignition state AND ESP or ABS intervention	= On = No intervention	0.200 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the current pressure sensor value is too high for the current Pedal Travel Sensor value.	Pressure sensor value* OR Pedal Travel Sensor value	> too high < too low	Ignition state AND ESP or ABS intervention	= On = No intervention	0.200 [s]	Continuous	Type A, 1 Trip
Left Front Inlet Control	C0010	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is	Voltage at lowside in off-state (Open Load feedback bit is set)	< 2 [V]	Ignition state	= On	20 [s]	Cyclically	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	> 6.9 [V] = True = False		every 20 [s]	
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Left Front Outlet Control	C0011	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	 > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])					
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Left Rear Inlet Control	C0018	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power	Current through low-side driver (Over Current feedback bit is set) OR	> 4 - 6.5 [A]	Ignition state AND	= On	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		Ground Lost, Free Wheeling Lost failure.	Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Any valve test is activated	= False			
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register	= True = True	Ignition state AND Valve relay supply voltage	= On > 6.9 [V]	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			OR Unexpected ASIC Valve Driver feedback	 = True	AND Hydraulic request is set	 = False			
Left Rear Outlet Control	C0019	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND	= On = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Any valve test is activated	= False			
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Master Cylinder Piston Position Higher Than Expected	C05D2	This monitoring checks if the current pressure sensor value is too low for the current Pedal Travel Sensor value.	Pressure sensor value* OR Pedal Travel Sensor value	< too low > too high	Ignition state AND ESP or ABS intervention	= On = No intervention	0.200 [s]	Continuous	Type A, 1 Trip
Right Front Inlet Control	C0014	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement	= True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		unit.	OR Failure in HS ADC measurement OR Failure in PWM compare unit	 = True = True					
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Right Front Outlet Control	C0015	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation	Measured valve resistance	> 13.7 [Ohm]	Ignition state	= On	20 [s]	Cyclically	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		between the measured valve resistance and the defined valve resistance in the software.	OR Measured valve resistance	 < 4.8 [Ohm]	AND Outside of valve control	 = True		every 20 [s]	
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Right Rear Inlet Control	C001C	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Right Rear Outlet Control	C001D	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	= True > 20 [%]	Ignition state AND Valve relay supply voltage	= On > 6.9 [V]	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True = True	AND Any valve test is activated	= False			
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
TCS Control Channel "A" Valve 1	C0001	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	> 20 [%]					
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	 > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]					
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND	= On > 6.9 [V] = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	> 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Hydraulic request is set	= False			
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
TCS Control Channel "A" Valve 2	C0002	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 5 - 8 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve	Voltage at lowside in off-state (Open Load feedback bit is set) OR	< 2 [V]	Ignition state AND	= On	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		Driver Test due to defective coil low side and high side paths.	Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 0.075 - 0.125 [A] > 5 - 8 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	> 6.9 [V] = True = False			
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 6.9 [Ohm] < 2.2 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
TCS Control Channel "B" Valve 1	C0003	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Voltage at Qx (Free Wheeling Lost feedback bit is set)	> Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])					
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power	Current through low-side driver (Over Current feedback bit is set) OR	> 4 - 6.5 [A]	Ignition state AND	= On	0.03 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		Ground Lost, Free Wheeling Lost failure.	Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Any valve test is activated	= False			
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register	= True = True	Ignition state AND Valve relay supply voltage	= On > 6.9 [V]	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			OR Unexpected ASIC Valve Driver feedback	 = True	AND Hydraulic request is set	 = False			
		This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 4 - 6.5 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 13.7 [Ohm] < 4.8 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND	= On = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Any valve test is activated	= False			
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
TCS Control Channel "B" Valve 2	C0004	This monitoring checks continuously if the valve coil has Over Current, Over Temperature, Power Ground Lost, Free Wheeling Lost failure.	Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set)	> 5 - 8 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V])	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks cyclically if there is shortcut between valves during Silent Valve Driver Test due to defective coil low side and high side paths.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set) OR Current through low-side driver (Over Current feedback bit is set) OR Temperature (Over Temperature feedback bit is set) OR Voltage drop between PGND at the low-side driver and ECU-Gnd (PGND-Lost feedback bit is set) OR Voltage at Qx (Free Wheeling Lost feedback bit is set) OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set)	< 2 [V] < 0.075 - 0.125 [A] > 5 - 8 [A] > 195-220°C > 0.4 - 0.9 [V] > Clamping voltage (35 .. 40 [V]) - (0.6 .. 2.2 [V]) > 20 [%]	Ignition state AND Valve relay supply voltage AND Outside of valve control AND Hydraulic request is set	= On > 6.9 [V] = True = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks continuously if there is PWM failure or HsLs-Compare failure or wrong GateQx(ON/OFF) failure.	PWM failure feedback bit is set OR Deviation of measured currents right before and right after switching point (Hs-Ls Compare feedback bit is set) OR Wrong GateQx ON feedback bit is set OR Wrong GateQx OFF feedback bit is set	= True > 20 [%] = True = True	Ignition state AND Valve relay supply voltage AND Any valve test is activated	= On > 6.9 [V] = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks continuously if the valve-coil path has interruption.	Voltage at lowside in off-state (Open Load feedback bit is set) OR Current (Under Current feedback bit is set)	< 2 [V] > 0.075 - 0.125 [A]	Ignition state AND Any valve test is activated	= On = False	0.03 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is deviation between the measured valve resistance and the defined valve resistance in the software.	Measured valve resistance OR Measured valve resistance	> 6.9 [Ohm] < 2.2 [Ohm]	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks if there is failure inside valve driver actuation logic and actuation monitoring unit as well as inside valve driver ADC unit.	Failure in actuation logic and actuation compare logic OR Failure in LS ADC measurement OR Failure in HS ADC measurement OR Failure in PWM compare unit	= True = True = True = True	Ignition state AND Outside of valve control	= On = True	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if there is leakage current through valve-output-driver stage after valve actuation.	Leakage current through valve (masurement done ASIC-internally)	> 0.1 [A]	Ignition state AND Hydraulic request is set AND Any valve test is activated	= On = False = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
		This monitoring checks cyclically the ASIC-Valve-Driver internal output-driver actuation register.	ASIC Valve Driver Failure crosstalk OR Stuck at failure between or inside one ASIC Valve Driver actuation register OR Unexpected ASIC Valve Driver feedback	= True = True = True	Ignition state AND Valve relay supply voltage AND Hydraulic request is set	= On > 6.9 [V] = False	20 [s]	Cyclically every 20 [s]	Type A, 1 Trip
Ignition Switch Run Crank Line									
Ignition On/Start Switch Circuit High Voltage	P2535	This monitoring checks if the Ignition Switch Circuit is short to Battery.	Hardwired ignition switch circuit AND Engine controller run crank terminal status from CAN	> 4.5 [V] = Low	None	IsNullOrEmpty	2.5 [s]	Continuous	Type A, 1 Trip
Ignition On/Start Switch Circuit Low Voltage	P2534	This monitoring checks if the Ignition Switch Circuit is interrupted or short to GND.	Hardwired ignition switch circuit AND Engine controller run crank terminal status from CAN	< 2 [V] = High	None	IsNullOrEmpty	2.5 [s]	Continuous	Type A, 1 Trip
Ingition/ACC									
Ignition Switch Accessory Position Circuit Low	P2537	This monitoring checks if the Ignition Switch Accessory Circuit is interrupted or short to GND.	Run Crank Wakeup line AND Accessory Line	= High < 2 [V]	None	IsNullOrEmpty	0.5 [s]	Once	Type B, 2 Trips
Master Cylinder Pressure Sensor									
Brake Pressure Sensor "A" Range/Performance	C053D	This monitoring checks if there is transmission error at SENT line.	SENT internal error code is received from sensor	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
Brake Pressure Sensor "C" Circuit Range/Performance	C0574	This monitoring checks if the offset value of pressure sensor 1 is correct.	Offset value	> 12 [bar]	Ignition state AND Brake Pedal AND Acceleration AND Vehicle speed AND No active pressure build up by IPB-system	= On = released > 0 > 0 [mph] = True	Immediately	Once	Type A, 1 Trip
Internal Communication Failure with Pressure Sensor 1	C2A15	This monitoring checks if the SENT line is shorted to supply, open or the ground is interrupted.	Digital signal stable line high value detected	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the SENT line is shorted to ground or the sensor supply is interrupted.	Digital signal stable line low value detected	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is transmission error on SENT line.	Transmission error on SENT line	= True	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
System Voltage									
Control Module	U3000	This monitoring checks if redundant power supply switching is possible.	Switching the redundant power supply is not possible	= True	Ignition state	= On	0.050 [s]	Continuous	Type A, 1 Trip
System Voltage High	P0563	This monitoring checks if the supply voltage is within or above the acceptable range.	Power supply voltage	> 16.5 [V]	Actuation (apply or release) has been requested	= True	2 [s]	Continuous	Type B, 2 Trips
		This monitoring checks if there is an overvoltage measured at UBB supply line.	Measured UBB voltage	> 16 [V]	Ignition state	= On	0.200 [s]	Continuous	Type B, 2 Trips
		This monitoring checks if there is an overvoltage measured at UBB supply line.	Measured UBB voltage	> 20 [V]	Ignition state	= On	0.200 [s]	Continuous	Type B, 2 Trips
		This monitoring checks if there is an overvoltage measured at UBB supply line.	Measured UBB voltage	> 27 [V]	Ignition state	= On	0.200 [s]	Continuous	Type B, 2 Trips
		This monitoring checks if there is an existing overvoltage situation and this is only a replacement failure instead of other NET failures.	Network voltage AND Another NET failure has been detected	> 16 [V] = True	Ignition state	= On	Immediately	Continuous	Type B, 2 Trips

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
Wheel Speed Sensors									
Left Front Wheel Speed Sensor Circuit High	C0503	This monitoring checks if there is a short circuit of the WSS Front Left signal line to the battery.	Sensor current at the signal line	> 0.05 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a short circuit of the WSS Front Left supply line to the battery.	Current at sensor supply line	> 0.0336 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Left Front Wheel Speed Sensor Circuit Low	C0502	This monitoring checks for implausible error patterns of the signal which cannot be classified either as an electrical fault (such as supply to ground which are covered by other monitorings) or valid signal.	Current Value Monitoring detects failure AND Supply Line Monitoring detects failure AND Voltage Value Monitoring detects failure AND Signal is valid	= False = False = False = False	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is supply line short to ground or interruption failure in case of WSS Front Left.	Current at sensor supply line AND Current at sensor supply line	< 0.055 [A] > 0.16 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Left Front Wheel Speed Sensor Circuit/Open	C0500	This monitoring checks if there is a short to ground or interruption based on current measurement in case of WSS Front Left line.	Sensor current at the signal line	< 0.0038 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Left Front Wheel Speed Sensor Incorrect Component Installed	C0555	This monitoring checks if a wrong Wheel Speed Sensor type is mounted.	Stop pulse according to WSS protocol is detected	= False	Ignition state AND WSS Test has been finished	= On = True	3 [s]	Continuous	Type A, 1 Trip
Left Front Wheel Speed Sensor Intermittent/Erratic	C0504	This monitoring checks if there is an overflow in the Direct Memory Access Transfer Unit.	DMA buffer state	= 'overflow'	Ignition state AND WSS Test has been finished	= On = True	0.030 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if a wrong parity bit is received from WSS Front Left.	Parity information in ASIC differs from Parity information from WSS	= True	Ignition state	= On	1 [s]	Continuous	Type A, 1 Trip
Left Front Wheel Speed Sensor Range/Performance	C0501	This monitoring checks the WSS Front Left is mounted properly.	Magnetic flux density	< 0.0022 [T]	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a missing stop pulse from WSS Front Left detected.	Missing stop pulse is detected	= True	Ignition state AND WSS Test has been finished	= On = True	3.6 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is an undervoltage on the WSS Front Left Supply Line.	WSS Supply line (VDA sensor) OR WSS Supply line (DF11 sensor)	< 4.6 [V] < 4.85 [V]	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the system can recognize a WSS FL line failure.	Hardware check failed according to the ASIC internal register data	= True	Ignition state	= On	0.050 [s]	Once	Type A, 1 Trip
		This monitoring checks the amount of the magnetic poles of the WSS FL tone wheel for one rotation.	A gap in the raw WSS signal is consequently detected for a defined number of times	>= 10	Ignition state AND Vehicle speed AND ESP or ABS intervention AND Rough road is detected	= On Is in range of 6.21..37.28 [mph] = False = False	Immediately after recognizing the 10th gap	Continuous	Type A, 1 Trip
		This monitoring checks for a discontinuous WSS Signal.	(Wheel acceleration AND For a calibrated number of counts AND For time) OR	> 981 [m/s^2] = 2 < 1.2 [s]	Ignition state	= On	20 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			(Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle) OR (Number of detected increasing edges AND Within time)	> 500 [m/s^2] > 4 >= 3 = 0.005 [s]					
		This monitoring checks WSS for implausibly high wheel speed value.	Measured wheel speed	> 183.95 [mph]	Ignition state	= On	5 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the difference between the wheel speed sensor signals and WSS FL is within a valid range.	|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 12.43 [mph] < 20 [deg/s]	9-18 [s]	Continuous	Type A, 1 Trip
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed AND Curve driving	= On > 12.43 [mph] < 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed	= On >= 62.13 [mph]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	(Spinning wheel is detected OR Number of defective WSS OR ABS is not available OR Number of wheel velocities below 3.1 mph) AND Ignition state	= True > 2 = True > 3 = On	72 [s]		
		This monitoring checks if there is a lost Wheel Speed Sensor signal.	(Speed of one wheel AND Vehicle speed increase) OR (Speed of two wheels AND Vehicle speed increase)	= 0 [mph] > 7.38 [mph] = 0 [mph] > 12.97 (all wheel drive) or 7.38 (two wheel drive) [mph]	Ignition state AND ABS TCS EBD control AND Drive off from standstill	= On = False = True	0.500 [s]	Continuous	Type A, 1 Trip
			Speed of one wheel AND Vehicle speed increase	= 0 [mph] > 11.18 [mph]	Ignition state AND ABS TCS EBD control	= On = False	immediately		
			Wheel acceleration	< -300 [m/s^2]	Ignition state AND	= On	0.080 [s]		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Vehicle speed AND Aquaplaning	> 34.67 [mph] = False			
Left Rear Wheel Speed Sensor Circuit High	C050F	This monitoring checks if there is a short circuit of the WSS Rear Left signal line to the battery.	Sensor current at the signal line	> 0.05 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a short circuit of the WSS Rear Left supply line to the battery.	Current at sensor supply line	> 0.0336 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Left Rear Wheel Speed Sensor Circuit Low	C050E	This monitoring checks for implausible error patterns of the signal which cannot be classified either as an electrical fault (such as supply to ground which are covered by other monitorings) or valid signal.	Current Value Monitoring detects failure AND Supply Line Monitoring detects failure AND Voltage Value Monitoring detects failure AND Signal is valid	= False = False = False = False	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is supply line short to ground or interruption failure in case of WSS Rear Left.	Current at sensor supply line AND Current at sensor supply line	< 0.055 [A] > 0.16 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Left Rear Wheel Speed Sensor Circuit/Open	C050C	This monitoring checks if there is a short to ground or interruption based on current measurement in case of WSS Rear Left line.	Sensor current at the signal line	< 0.0038 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Left Rear Wheel Speed Sensor Incorrect Component Installed	C0557	This monitoring checks if a wrong Wheel Speed Sensor type is mounted.	Stop pulse according to WSS protocol is detected	= False	Ignition state AND WSS Test has been finished	= On = True	3 [s]	Continuous	Type A, 1 Trip
Left Rear Wheel Speed Sensor Intermittent/Erratic	C0510	This monitoring checks if there is an overflow in the Direct Memory Access Transfer Unit.	DMA buffer state	= 'overflow'	Ignition state AND WSS Test has been finished	= On = True	0.030 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if a wrong parity bit is received from WSS Rear Left.	Parity information in ASIC differs from Parity information from WSS	= True	Ignition state	= On	1 [s]	Continuous	Type A, 1 Trip
Left Rear Wheel Speed Sensor Range/Performance	C050D	This monitoring checks the WSS Rear Left is mounted properly.	Magnetic flux density	< 0.0022 [T]	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a missing stop pulse from WSS Rear Left detected.	Missing stop pulse is detected	= True	Ignition state AND WSS Test has been finished	= On = True	3.6 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is an undervoltage on the WSS Rear Left Supply Line.	WSS Supply line (VDA sensor) OR WSS Supply line (DF11 sensor)	< 4.6 [V] < 4.85 [V]	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the system can recognize a WSS RL line failure.	Hardware check failed according to the ASIC internal register data	= True	Ignition state	= On	0.050 [s]	Once	Type A, 1 Trip
		This monitoring checks the amount of the magnetic poles of the WSS RL tone wheel for one rotation.	A gap in the raw WSS signal is consequently detected for a defined number of times	>= 10	Ignition state AND Vehicle speed AND ESP or ABS intervention AND Rough road is detected	= On Is in range of 6.21..37.28 [mph] = False = False	Immediately after recognizing the 10th gap	Continuous	Type A, 1 Trip
		This monitoring checks for a discontinuous WSS Signal.	(Wheel acceleration AND For a calibrated number of counts AND	> 981 [m/s^2] = 4	Ignition state	= On	20 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			For time) OR (Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle) OR (Number of detected increasing edges AND Within time)	< 1.2 [s] > 500 [m/s^2] > 4 >= 3 = 0.005 [s]					
		This monitoring checks WSS for implausibly high wheel speed value.	Measured wheel speed	> 183.95 [mph]	Ignition state	= On	5 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the difference between the wheel speed sensor signals and WSS RL is within a valid range.	|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 12.43 [mph] < 20 [deg/s]	9-18 [s]	Continuous	Type A, 1 Trip
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed AND Curve driving	= On < 12.43 [mph] < 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed	= On >= 62.13 [mph]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	(Spinning wheel is detected OR Number of defective WSS OR ABS is not available OR Number of wheel velocities below 3.1 mph) AND Ignition state)	= True > 2 = True > 3 = On	72 [s]		
		This monitoring checks if there is a lost Wheel Speed Sensor signal.	(Speed of one wheel AND Vehicle speed increase) OR (Speed of two wheels AND Vehicle speed increase)	= 0 [mph] > 7.38 [mph] = 0 [mph] > 12.97 (all wheel drive) or 7.38 (two wheel drive) [mph]	Ignition state AND ABS TCS EBD control AND Drive off from standstill	= On = False = True	0.500 [s]	Continuous	Type A, 1 Trip
			Speed of one wheel AND Vehicle speed increase	= 0 [mph] > 11.18 [mph]	Ignition state AND ABS TCS EBD control	= On = False	immediately		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Wheel acceleration	< -300 [m/s^2]	Ignition state AND Vehicle speed AND Aquaplaning	= On > 34.67 [mph] = False	0.080 [s]		
Right Front Wheel Speed Sensor Circuit High	C0509	This monitoring checks if there is a short circuit of the WSS Front Right signal line to the battery.	Sensor current at the signal line	> 0.05 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a short circuit of the WSS Front Right supply line to the battery.	Current at sensor supply line	> 0.0336 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Right Front Wheel Speed Sensor Circuit Low	C0508	This monitoring checks for implausible error patterns of the signal which cannot be classified either as an electrical fault (such as supply to ground which are covered by other monitorings) or valid signal.	Current Value Monitoring detects failure AND Supply Line Monitoring detects failure AND Voltage Value Monitoring detects failure AND Signal is valid	= False = False = False = False	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is supply line short to ground or interruption failure in case of WSS Front Right.	Current at sensor supply line AND Current at sensor supply line	< 0.055 [A] > 0.16 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Right Front Wheel Speed Sensor Circuit/Open	C0506	This monitoring checks if there is a short to ground or interruption based on current measurement in case of WSS Front Right line.	Sensor current at the signal line	< 0.0038 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Right Front Wheel Speed Sensor Incorrect Component Installed	C0556	This monitoring checks if a wrong Wheel Speed Sensor type is mounted.	Stop pulse according to WSS protocol is detected	= False	Ignition state AND WSS Test has been finished	= On = True	3 [s]	Continuous	Type A, 1 Trip
Right Front Wheel Speed Sensor Intermittent/Erratic	C050A	This monitoring checks if there is an overflow in the Direct Memory Access Transfer Unit.	DMA buffer state	= 'overflow'	Ignition state AND WSS Test has been finished	= On = True	0.030 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if a wrong parity bit is received from WSS Front Right.	Parity information in ASIC differs from Parity information from WSS	= True	Ignition state	= On	1 [s]	Continuous	Type A, 1 Trip
Right Front Wheel Speed Sensor Range/Performance	C0507	This monitoring checks the WSS Front Right is mounted properly.	Magnetic flux density	< 0.0022 [T]	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a missing stop pulse from WSS Front Right detected.	Missing stop pulse is detected	= True	Ignition state AND WSS Test has been finished	= On = True	3.6 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is an undervoltage on the WSS Front Right Supply Line.	WSS Supply line (VDA sensor) OR WSS Supply line (DF11 sensor)	< 4.6 [V] < 4.85 [V]	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the system can recognize a WSS FR line failure.	Hardware check failed according to the ASIC internal register data	= True	Ignition state	= On	0.050 [s]	Once	Type A, 1 Trip
		This monitoring checks the amount of the magnetic poles of the WSS FR tone wheel for one rotation.	A gap in the raw WSS signal is consequently detected for a defined number of times	>= 10	Ignition state AND Vehicle speed AND ESP or ABS intervention AND Rough road is detected	= On Is in range of 6.21..37.28 [mph] = False = False	Immediately after recognizing the 10th gap	Continuous	Type A, 1 Trip
		This monitoring checks for a discontinuous WSS Signal.	(Wheel acceleration AND	> 981 [m/s^2]	Ignition state	= On	20 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			For a calibrated number of counts AND For time) OR (Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle) OR (Number of detected increasing edges AND Within time)	= 3 < 1.2 [s] > 500 [m/s^2] > 4 >= 3 = 0.005 [s]					
		This monitoring checks WSS for implausibly high wheel speed value.	Measured wheel speed	> 183.95 [mph]	Ignition state	= On	5 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the difference between the wheel speed sensor signals and WSS FR is within a valid range.	|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 12.43 [mph] < 20 [deg/s]	9-18 [s]	Continuous	Type A, 1 Trip
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed AND Curve driving	= On > 12.43 [mph] < 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed	= On >= 62.13 [mph]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	(Spinning wheel is detected OR Number of defective WSS OR ABS is not available OR Number of wheel velocities below 3.1 mph) AND Ignition state)	= True > 2 = True > 3 = On	72 [s]		
		This monitoring checks if there is a lost Wheel Speed Sensor signal.	(Speed of one wheel AND Vehicle speed increase) OR (Speed of two wheels AND Vehicle speed increase)	= 0 [mph] > 7.38 [mph] = 0 [mph] > 12.97 (all wheel drive) or 7.38 (two wheel drive) [mph]	Ignition state AND ABS TCS EBD control AND Drive off from standstill	= On = False = True	0.500 [s]	Continuous	Type A, 1 Trip
			Speed of one wheel	= 0 [mph]	Ignition state	= On	immediately		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			AND Vehicle speed increase	> 11.18 [mph]	AND ABS TCS EBD control	= False			
			Wheel acceleration	< -300 [m/s^2]	Ignition state AND Vehicle speed AND Aquaplaning	= On > 34.67 [mph] = False	0.080 [s]		
Right Rear Wheel Speed Sensor Circuit High	C0515	This monitoring checks if there is a short circuit of the WSS Rear Right signal line to the battery.	Sensor current at the signal line	> 0.05 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a short circuit of the WSS Rear Right supply line to the battery.	Current at sensor supply line	> 0.0336 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Right Rear Wheel Speed Sensor Circuit Low	C0514	This monitoring checks for implausible error patterns of the signal which cannot be classified either as an electrical fault (such as supply to ground which are covered by other monitorings) or valid signal.	Current Value Monitoring detects failure AND Supply Line Monitoring detects failure AND Voltage Value Monitoring detects failure AND Signal is valid	= False = False = False = False	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is supply line short to ground or interruption failure in case of WSS Rear Right.	Current at sensor supply line AND Current at sensor supply line	< 0.055 [A] > 0.16 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Right Rear Wheel Speed Sensor Circuit/Open	C0512	This monitoring checks if there is a short to ground or interruption based on current measurement in case of WSS Rear Right line.	Sensor current at the signal line	< 0.0038 [A]	Ignition state AND WSS Test has been finished	= On = True	0.120 [s]	Continuous	Type A, 1 Trip
Right Rear Wheel Speed Sensor Incorrect Component Installed	C0558	This monitoring checks if a wrong Wheel Speed Sensor type is mounted.	Stop pulse according to WSS protocol is detected	= False	Ignition state AND WSS Test has been finished	= On = True	3 [s]	Continuous	Type A, 1 Trip
Right Rear Wheel Speed Sensor Intermittent/Erratic	C0516	This monitoring checks if there is an overflow in the Direct Memory Access Transfer Unit.	DMA buffer state	= 'overflow'	Ignition state AND WSS Test has been finished	= On = True	0.030 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if a wrong parity bit is received from WSS Rear Right.	Parity information in ASIC differs from Parity information from WSS	= True	Ignition state	= On	1 [s]	Continuous	Type A, 1 Trip
Right Rear Wheel Speed Sensor Range/Performance	C0513	This monitoring checks the WSS Rear Right is mounted properly.	Magnetic flux density	< 0.0022 [T]	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is a missing stop pulse from WSS Rear Right detected.	Missing stop pulse is detected	= True	Ignition state AND WSS Test has been finished	= On = True	3.6 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if there is an undervoltage on the WSS Rear Right Supply Line.	WSS Supply line (VDA sensor) OR WSS Supply line (DF11 sensor)	< 4.6 [V] < 4.85 [V]	Ignition state	= On	0.060 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the system can recognize a WSS RR line failure.	Hardware check failed according to the ASIC internal register data	= True	Ignition state	= On	0.050 [s]	Once	Type A, 1 Trip
		This monitoring checks the amount of the magnetic poles of the WSS RR tone wheel for one rotation.	A gap in the raw WSS signal is consequently detected for a defined number of times	>= 10	Ignition state AND Vehicle speed AND ESP or ABS intervention AND Rough road is detected	= On Is in range of 6.21..37.28 [mph] = False = False	Immediately after recognizing the 10th gap	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks for a discontinuous WSS Signal.	(Wheel acceleration AND For a calibrated number of counts AND For time) OR (Wheel acceleration AND Accumulation of the weighted noise amplitude in current driving cycle) OR (Number of detected increasing edges AND Within time)	> 981 [m/s^2] = 5 < 1.2 [s] > 500 [m/s^2] > 4 >= 3 = 0.005 [s]	Ignition state	= On	20 [s]	Continuous	Type A, 1 Trip
		This monitoring checks WSS for implausibly high wheel speed value.	Measured wheel speed	> 183.95 [mph]	Ignition state	= On	5 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the difference between the wheel speed sensor signals and WSS RR is within a valid range.	|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 12.43 [mph] < 20 [deg/s]	9-18 [s]	Continuous	Type A, 1 Trip
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed AND Curve driving	= On < 12.43 [mph] < 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	Ignition state AND Vehicle speed AND Curve driving	= On < 62.13 [mph] > 20 [deg/s]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 6.5 [%] of the vehicle speed	Ignition state AND Vehicle speed	= On >= 62.13 [mph]	9-18 [s]		
			|Difference between maximum and minimum wheel speed|	> 4.02 [mph]	(Spinning wheel is detected OR Number of defective WSS OR ABS is not available OR Number of wheel velocities below 3.1 mph) AND Ignition state)	= True > 2 = True > 3 = On	72 [s]		
		This monitoring checks if there is a lost Wheel Speed Sensor signal.	(Speed of one wheel AND Vehicle speed increase) OR (Speed of two wheels AND	= 0 [mph] > 7.38 [mph] = 0 [mph]	Ignition state AND ABS TCS EBD control AND Drive off from standstill	= On = False = True	0.500 [s]	Continuous	Type A, 1 Trip

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Vehicle speed increase)	> 12.97 (all wheel drive) or 7.38 (two wheel drive) [mph]					
			Speed of one wheel AND Vehicle speed increase	= 0 [mph] > 11.18 [mph]	Ignition state AND ABS TCS EBD control	= On = False	immediately		
			Wheel acceleration	< -300 [m/s^2]	Ignition state AND Vehicle speed AND Aquaplaning	= On > 34.67 [mph] = False	0.080 [s]		
Vehicle Speed - Wheel Speed Correlation	P215A	This monitoring checks if sensor signals seem to be affected by temporary failure suspicion at the same time to ensure the proper working of ABS functionality.	Number of sensor signal monitoring fault suspicions detected	> 2	Ignition state	= On	0.500 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if the source of the invalid signal can be found.	|Difference between maximum and minimum wheel speed|	> 52.12 [mph]	Ignition state AND Vehicle speed	= On > 3.1 [mph]	9 - 72 [s]	Continuous	Type A, 1 Trip
		This monitoring checks if sensor signals seem to be affected by temporary failure suspicion at the same time to ensure the proper working of Vehicle Dynamic Control functionality.	Number of sensor signal monitoring fault suspicions detected	> 1	Ignition state	= On	0.100 [s]	Continuous	Type A, 1 Trip
Emissions Neutral DTCs									
Wheel Speed Sensors Direction Correlation	C003F	This monitoring checks the rotation direction of wheel speed sensors.	Rotation direction of monitored wheel differs from at least two other wheels rotation direction	= True	Ignition state AND Vehicle speed AND Number of WSS direction information is available	= On > 3.13 [mph] >= 3	20 [s]	Continuous	Type C, No MIL, Emissions Neutral
Brake Fluid	C0049	This monitoring checks if the brake fluid reservoir is empty.	Fluid level sensor value is set to logical '1'	= True	Ignition state	= On	10 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the fluid level sensor is shorted to battery.	UADC/UZP voltage ratio	> 86 [%]	Ignition state	= On	1 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the fluid level sensor is shorted to ground.	UADC/UZP voltage ratio	< 16 [%]	Ignition state	= On	1 [s]	Continuous	Type C, No MIL, Emissions Neutral
Steering Wheel Position Sensor	C0051	This monitoring checks if the steering angle signal is constant when it should change.	Variation of steering angle signal during left and right curve since last vehicle standstill	< 5 [deg]	Ignition state AND Vehicle speed AND Backwards driving is detected AND Blocked wheels are detected AND SAS is initialized and calibrated AND Yaw Rate Sensor signal is valid AND Ay sensor signal is valid	= On > 3.35 [mph] = False = False = True = True = True	0.040 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the steering angle velocity is plausible or not.	Steering angle signal gradient OR	> 30 [deg]/0.020 [s]	Ignition state AND	= On	0.060 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			Steering angle signal gradient after 2 messages OR Steering angle signal gradient after 3 messages OR SAS message counter is updated	> 60 [deg]/0.020 [s] > 90 [deg]/0.020 [s] = False	SAS is initialized and calibrated AND Number of SAS messages sent within the last task cycle AND Vehicle speed	= True = between 1 and 3 > 3.13 [mph]			
		This monitoring checks if the Steering angle offset has an acceptable value.	Steering angle offset	> 15 [deg]	Ignition state AND SAS is initialized and calibrated AND Vehicle speed AND Vehicle speed AND Circular driving AND Vehicle forward driving AND Bank curve is detected AND SAS absolute angle	= On = True >= 6.71 [mph] <= 124.15 [mph] = False = True = False <= 30 [deg]	immediately	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks the Steering Angle Sensors range by checking the raw sensor signal.	Absolute value of received raw sensor signal	> 810 [deg]	Ignition state AND SAS is initialized and calibrated AND Undervoltage is detected AND SAS Sensor failure is detected	= On = True = False = False	3 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks for a physically plausible steering angle signal.	Difference between measured steering angle and model calculated value based on yaw rate signal	> 10-100 [deg/s] velocity dependent (the bigger the velocity, the lower the threshold)	Ignition state AND SAS is initialized and calibrated AND Undervoltage is detected AND SAS Sensor failure is detected	= On = True = False = False	0.4 [s] - 4.8 [s] (small deviations require long detection time and large deviations require small detection time)	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the sign of the steering angle signal is incorrect.	Calculated integral value during forward driving OR Calculated integral value independently from driving direction	> -30 [deg] > -90 [deg]	Ignition state AND Vehicle speed AND Curve driving with yaw rate	= On > 43.62 [mph] >= 3 [deg/s]	immediately	Continuous	Type C, No MIL, Emissions Neutral
Lateral Acceleration Sensor	C0061	This monitoring checks if the value sent by the lateral acceleration sensor is plausible or not.	|Measured raw value of lateral acceleration|	> 15 [m/s^2]	Ignition state AND Lateral fault at inertial sensors is detected	= On = False	0.800 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the lateral acceleration offset is correct.	| Lateral acceleration offset |	> 2.25 [m/s^2]	Ignition state AND Vehicle speed AND	= On > 6.71 [mph]	Immediately	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Vehicle speed AND Lateral fault at inertial sensors is detected AND Circular driving AND Bank curve is detected AND Vehicle forward driving AND | Filtered AY sensor signal |	< 124.15 [mph] = False = False = False = True <= 2.25 [m/s^2]			
		This monitoring checks for a physically plausible lateral acceleration signal.	Standstill monitoring: The filtered value of the lateral acceleration	> 7 [m/s^2]	Ignition state AND Vehicle speed AND Wheels are locked AND Lateral fault at inertial sensors is detected AND ESP or ABS intervention	= On < 2.23 [mph] = False = False = True	0.400 [s]	Continuous	Type C, No MIL, Emissions Neutral
			Monitoring during model observability: Integrated value	> 10 [m/s^2]	Ignition state AND Measured yaw rate fits to the yaw rate calculated from steering angle AND Vehicle speed AND YRS Offset compensation calculation finished AND Oversteering driving behavior is detected	= On = True > 11.18 [mph] = True = False	Depends on the amount of failure.		
			Monitoring during validity: Comparison of actual differences with the permissible difference within model validity	> 2.5 [m/s^2]	Ignition state AND Bank curve is detected AND Straight ahead driving AND Vehicle moving direction is forward	= On = False = True = True	1.6 [s]		
Yaw Rate Sensor	C0063	This monitoring checks if the sensitivity deviation of the yaw rate is within an acceptable range.	Sensitivity deviation of the yaw rate	> 0.25	Ignition state AND ESP ABS intervention AND Curve driving with yaw rate AND Sensor Offset Compensation is finished AND	= On = No intervention > 0.1745 [deg/s] = True	immediately	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Vehicle Moving Direction is forward AND SAS Status is faultfree	= True = True			
		This monitoring checks if the yaw rate gradient from the sensor is plausible.	Yaw rate signal gradient depending on the driving condition	> 10-23 [deg/s]	Ignition state AND Yaw Rate Sensor is initialized	= On = True	0.120 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the range of yaw rate is within limits during driving and during standstill.	Absolute value of the yaw rate sensor signal (while driving)	> 94.75 [deg/s]	Ignition key AND Yrs sensor failure detected AND ESP / ABS Intervention AND Stable driving conditions are fullfilled (min vehicle speed?) AND ESP_Off button state (PATA) AND Vehicle reverse moving direction AND Skidding and Hand brake	= On = False = False = True =OFF = False = False	0.8 [s]	Continuous	Type C, No MIL, Emissions Neutral
			Absolute value of the yaw rate sensor signal (while first standstill)	> 30 [deg/s]	Ignition key AND Yrs sensor failure detected AND Vehicle standstill detected	= On = False = True	5 [s]		
		This monitoring checks if the Yaw Rate offset is within limits depending on the driving situation.	Yaw rate offset	> 0.2622 [rad/s]	Ignition key AND Yrs status is faultfree AND Vehicle speed AND Stable driving conditions are fullfilled AND ESP / ABS intervention AND Forward driving detected AND Full system mode active AND offset compensation was completed	= On = True >= 3.35 [mph] = True = False = True = True = False	Immediately	Continuous	Type C, No MIL, Emissions Neutral
			Yaw rate offset at the end of the fast compensation	> 0.1309 [rad/s]	Fast compensation prepared AND Forward driving detected	= True = True	immediately		
			Yaw rate offset	> 0.1309 [rad/s]	Ignition key AND	= On	Immediately		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Stable driving conditions are fullfilled (no inclined road) AND ESP / ABS intervention AND Forward driving detected AND Full system mode active AND (Standstill offset compensation was completed OR Fast offset compensation was copleted) AND Vehicle speed	= True = False = True = True = True = True >=3m/s			
			Filtered yaw rate offset	> 0.09163 [rad/s]	Ignition key AND Full system mode active AND Wheel speed sensor status is faultfree AND Vehicle was in standstill for 1.52 [s] AND Drive off	= On = True = True = True = True	Immediately		
		This monitoring checks if the yaw rate sensor value is plausible.	The fault integral calculated from the difference between the measured offset compensated yaw rate and the reference yaw rate (by adding up the quadratic value of the dynamic threshold value each time when this difference is present)	> 0.0061 [rad^2/s]	Ignition key AND Full system mode active AND Forward driving detected AND Yrs compensation Finished AND Vehicle speed AND vehicle oscillation (instability)	= On = True = True = True >= 13.42 [mph] = False	Immediately	Continuous	Type C, No MIL, Emissions Neutral
			Difference between measured steering angle and model calculated value based on yaw rate signal	> 10 [deg/s] - 100 [deg/s] velocity dependent (the bigger the velocity, the lower the threshold)	a) Curve branch: Ignition key AND Vehicle speed AND Full system mode AND Lateral acceleration AND Curve driving detected	= On > 3.35 [mph] = active > 1.11 [mph] = True	0.4-4.8 [s]		Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					b) Stability branch: Ignition key AND Vehicle speed AND Full system mode AND No large wheel speed differences detected AND Stable acceleration detected	= On > 3.35 [mph] = active = True = True	0.4-4.8 [s]		Type C, No MIL, Emissions Neutral
					c) Straight ahead branch: Ignition key AND Vehicle speed AND Full system mode AND Lateral acceleration AND Yaw rate	= On > 3.35 [mph] = active < 0.5 [m/s^2] < 0.035 [rad/s]	0.4-4.8 [s]		Type C, No MIL, Emissions Neutral
			Measured Yaw Rate deviation	> 0.04363 [rad/s] + situation depending values	Ignition key AND Stable driving conditions are fullfilled (no inclined road) AND ESP / ABS intervention AND Forward driving detected AND Full system mode active AND Vehicle speed	= On = True = False = True = True >= 13.42 [mph]	1.600 [s]		Type C, No MIL, Emissions Neutral
		This monitoring checks if the sign of the yaw rate signal is incorrect.	Measured yaw rate and the model yaw rate have not the same sign	= True	Ignition state AND Vehicle Moving Direction is forward AND Curve driving AND Vehicle speed AND System Post Run AND Maximum currently uncompensated wheel tolerance AND SAS Center identified	= On = True > 3 [deg/s] > 43.62 [mph] = False < 6 [%] = True	3 [s]	Continuous	Type C, No MIL, Emissions Neutral
Stability System Active Too Long	C006B	This monitoring checks if VDC is active for an implausibly long time (during normal and sport mode).	(Vehicle speed AND Vehicle Dynamics Control activation for) OR (Vehicle speed AND Vehicle Dynamics Control activation for)	<= 62.19 [mph] > 10 [s] > 62.19 [mph] > 5 [s]	Ignition state AND Vehicle speed	= On > 12.43 [mph]	5-10 [s]	Continuous	Type C, No MIL, Emissions Neutral
			(Vehicle speed	<= 62.19 [mph]	Ignition state	= On	10-20 [s]		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
			AND Vehicle Dynamics Control activation for) OR (Vehicle speed AND Vehicle Dynamics Control activation for)	 > 20 [s] > 62.19 [mph] > 10 [s]	AND Vehicle speed	 > 12.43 [mph]			
Longitudinal Acceleration Sensor Circuit/Open	C0551	This monitoring checks if there is a longitudinal acceleration sensor failure due to stuck signal.	Deviation between measured longitudinal acceleration and longitudinal acceleration calculated by differentiating vehicle reference speed AND For time	> 36 [%] > 2 [s]	Ignition state AND ESP or ABS intervention AND Longitudinal fault at inertial sensors is detected AND Vehicle speed AND Wheel speed signals are valid AND Ax Modulation	= On = False = False >= 13.42 [mph] = True <= 0.5 [m/s^2]	2 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the acceleration measured by the longitudinal acceleration sensor is implausible.	Longitudinal acceleration value AND For time	> 4 [m/s^2] > 20 [s]	Ignition state AND Brake light switch is set AND Brake light switch failure is set AND Vehicle speed AND ESP or ABS intervention AND Longitudinal fault at inertial sensors is detected AND Wheel speed signals are valid	= On = False = False > 3.35 [mph] = False = False = True	20 [s]	Continuous	Type C, No MIL, Emissions Neutral
			Difference between measured and offset corrected longitudinal acceleration and calculated longitudinal acceleration AND For time	> 3.5 [m/s^2] >= 4 [s]	Ignition state AND ESP or ABS intervention AND Vehicle speed AND Wheel speed signals are valid AND Longitudinal fault at inertial sensors is detected AND Vehicle moving direction is forward AND Off-road driving suspected	= On = False > 3.35 [mph] = True = False = True = False	4 [s]		

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if the raw value sent by the longitudinal acceleration sensor is plausible or not.	|Measured raw value of longitudinal acceleration| AND For time	> 15 [m/s2] >= 3 [s]	Ignition state AND Longitudinal fault at inertial sensors is detected	= On = False	3 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the longitudinal acceleration offset is correct.	| Longitudinal acceleration offset |	> 2.25 [m/s^2]	Ignition state AND Longitudinal fault at inertial sensors is detected AND Vehicle speed AND Vehicle speed AND ESP or ABS intervention AND Vehicle moving direction is forward	= On = False > 6.71 [mph] < 124.15 [mph] = False = True	0.040 [s]	Continuous	Type C, No MIL, Emissions Neutral
Brake Booster Temperature Sensor "B" Circuit Low	C0579	This monitoring checks if the BLM Temperature Signal 2 is shorted to Ground	BLM Temperature Signal 2 AND Times undervoltage detected	< 0.03 [V] >= 2	Ignition state	= On	0.600 [s]	Continuous	Type C, No MIL, Emissions Neutral
Brake Booster Temperature Sensor "B" Circuit High	C057A	This monitoring checks if the BLM Temperature Signal 2 is shorted to Supply	BLM Temperature Signal 2 AND Times overvoltage detected	> 3.34 [V] >= 2	Ignition state	= On	0.600 [s]	Continuous	Type C, No MIL, Emissions Neutral
Reverse Gear Signal Circuit	C102A	This monitoring checks if the reverse gear signal is permanently at high level.	Reverse gear signal AND Vehicle speed AND For time	= engaged > 24.85 [mph] > 20 [s]	Ignition state	= On	20 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the reverse gear signal is permanently at low level.	Reverse gear signal AND Vehicle is on a slope of AND Brake light switch is set AND For time	= not engaged < -2 [%] = True >= 4 [s]	Ignition state	= On	4 [s]	Continuous	Type C, No MIL, Emissions Neutral
Wheel Speed Sensor Frequency	C10EE	This monitoring checks if there is a DMA buffer overflow.	DMA buffer state	= 'overflow'	Ignition state	= On	0.030 [s]	Continuous	Type C, No MIL, Emissions Neutral
Autonomous Braking Accelerator Actual Position Status Message Counter Incorrect	C1288	This monitoring checks if there is any error in the received 'Autonomous Braking Accelerator Actual Position Status Protection Value' of message PPEI_Torque_Request_Status_HS signal, or an invalid value is indicated.	Signal error counter value	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Torque Request Status HS' AND Start Stop function is inactive	= True = received = True	0.125 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is any error in the received 'Autonomous Braking Accelerator Actual Position Status Rolling Count' of the message PPEI_Torque_Request_Status_HS signal, or an invalid value is indicated.	Signal error counter value	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Torque Request Status HS' AND Start Stop function is inactive	= True = received = True	0.125 [s]	Continuous	Type C, No MIL, Emissions Neutral
Park Assist Control Module	C15A3	This monitoring checks for stuck distance information from APA sensor.	Distance travelled with stuck signal while the vehicle is still moving AND Time elapsed with stuck signal while the vehicle is moving	> 0.2 [m] > 0.6 [s]	Engine running AND Park Assist function is active	= On = True	0.600 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					AND Vehicle speed AND Distance measured by the APA sensor is not changing AND EBCM receives information from WSS that the vehicle is moving	 > 0 [mph] = True = True			
		This monitoring checks if the vehicle velocity for the parking maneuver is within the safe limits.	Velocity value received from APA ECU	> 6.21 [mph]	Engine running AND Park Assist function is active	= On = True	immediately	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the APA Status is in context of the status of the EBCM park assist function	APA status	= Active or Finished or Error	Engine running AND APA is in Control or Active Hold state	= On = True	immediately	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the vehicle velocity for the parking maneuver is not too low for any kind of movement.	Velocity value received from APA ECU	= 0 [mph]	Engine running AND Park Assist function is active AND Vehicle speed	= On = True = 0 [mph]	immediately	Continuous	Type C, No MIL, Emissions Neutral
Vehicle Hold Enable Status Not Plausible	C15C6	This monitoring checks if AVH enabled and AVH active signals are different from those which are transmitted by EBCM.	AVH enabled/AVH active signals received from ECM	<> signals transmitted by EBCM	Communication related conditions are fulfilled	= True	2 [s]	Continuous	Type C, No MIL, Emissions Neutral
Antilock Brake System Active Too Long	C15D5	This monitoring checks if the ABS is correctly triggered.	ABS intervention for time	>= 60 [s]	Ignition state	= On	60 [s]	Continuous	Type C, No MIL, Emissions Neutral
Left Front Wheel Speed Sensor Direction (Incorrect Mounting)	C2A01	This monitoring checks if the measured rotation direction of FL wheel is correct.	Rotation direction of monitored wheel differs from at least two other wheels rotation direction	= True	Ignition state AND Vehicle speed AND At least two WSS direction information is available	= On > 3.13 [mph] = True	20 [s]	Continuous	Type C, No MIL, Emissions Neutral
Right Front Wheel Speed Sensor Direction (Incorrect Mounting)	C2A02	This monitoring checks if the measured rotation direction of FR wheel is correct.	Rotation direction of monitored wheel differs from at least two other wheels rotation direction	= True	Ignition state AND Vehicle speed AND At least two WSS direction information is available	= On > 3.13 [mph] = True	20 [s]	Continuous	Type C, No MIL, Emissions Neutral
Left Rear Wheel Speed Sensor Direction (Incorrect Mounting)	C2A03	This monitoring checks if the measured rotation direction of RL wheel is correct.	Rotation direction of monitored wheel differs from at least two other wheels rotation direction	= True	Ignition state AND Vehicle speed AND At least two WSS direction information is available	= On > 3.13 [mph] = True	20 [s]	Continuous	Type C, No MIL, Emissions Neutral
Right Rear Wheel Speed Sensor Direction (Incorrect Mounting)	C2A04	This monitoring checks if the measured rotation direction of RR wheel is correct.	Rotation direction of monitored wheel differs from at least two other wheels rotation direction	= True	Ignition state AND Vehicle speed AND	= On > 3.13 [mph]	20 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					At least two WSS direction information is available	= True			
Engine Control Module Indicated Torque Interface Failed	C2A07	This monitoring checks if signal EngTrqRdFlrSt of the message PPEI_Engine_Torque_Status_2_HS is received with a specified value which means there is a communication failure.	EngTrqRdFlrSt signal is received with value AND Failure counter value	= 4 = 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Engine Torque Status 2 HS'	= True = received	0.125 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if EngTrqRdFlrSt of the message PPEI_Engine_Torque_Status_2_HS is received with proper value.	EngTrqRdFlrSt signal is received with value AND Failure counter value	= 5 or 6 or 7 >= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Engine Torque Status 2 HS'	= True = received	0.125 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if EngTrqRdFlrSt signal of the message PPEI_Engine_Torque_Status_2_HS is set to a defined value.	Signal is set to	= 1 or 2	Communication related conditions are fulfilled AND New message 'PPEI Engine Torque Status 2 HS'	= True = received	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
Brake Hydraulic Circuit Excessive Compliance - Level 1	C2A17	This monitoring checks if there is air in the hydraulic backup circuit components: - wheel circuits - main brake cylinder primary circuit (1) - main brake cylinder secondary circuit (2).	Calculated air volume (based on Pressure sensor 2 value and plunger position)	> 3.5 [cm^3]	(Vehicle was driven above OR For time) AND Ignition state AND Braking is requested (either by driver or by external) AND Parking brake is being applied AND Parking brake is being released AND Vehicle stationary	> 8.95 [mph] > 30 [s] = Off (Postrun) = True = False = False Is in range of 5..120 [s]	8 [s]	Once	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is air in the hydraulic components: - wheel circuits - plunger circuit - internal circuit below CSV	Calculated air volume (based on Pressure sensor 2 value and plunger position)	> 3.5 [cm^3]	BBF System state AND Braking is requested (either by driver or by external) AND Pressure sensor 2 value AND For a number of brake events	= Full OR Degraded pedal feel = True >= 7 [bar] >= 2	0.500 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is air inside the plunger.	Calculated air volume (based on Pressure sensor 2 value and plunger position)	> 3.5 [cm^3]	(Vehicle was driven above OR For time) AND Ignition state AND Braking is requested (either by driver or by external)	> 8.95 [mph] > 30 [s] = Off (Postrun) = True	4 [s]	Once	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					AND Parking brake is being applied AND Parking brake is being released AND Vehicle stationary	 = False = False Is in range of 5..120 [s]			
Park Brake in Service Release Mode	C2A1D	This monitoring checks if the EPB system is in maintenance mode.	Maintenance mode flag is set	= True	Brake states have been commanded to release to maintenance position	= True	0.010 [s]	Continuous	Type C, No MIL, Emissions Neutral
Brake System Reference Speed Not Plausible	C2A1F	This monitoring checks if ABS controller detected that there has been no pressure increase for an implausible long time.	Implausible ABS control is detected AND On high mue (friction coefficient)	= True = True	Ignition state AND ABS intervention	= On = True	0.800 [s]	Continuous	Type C, No MIL, Emissions Neutral
			Implausible ABS control is detected AND On low mue (friction coefficient)	= True = True	Ignition state AND ABS intervention	= On = True	2 [s]		
Brake Hydraulic Circuit Leak Detected - Level 1	C2A22	This monitoring checks if there is a leak and/or air in the backup circuit.	Calculated leakage AND Calculated air AND For time	< 200 [mm^3/s] < 3.5 [cm^3] > 11.4 [s]	(Vehicle was driven above OR For time) AND Ignition state AND Braking is requested (either by driver or by external) AND Parking brake is being applied AND Parking brake is being released AND Vehicle stationary	> 8.95 [mph] > 30 [s] = Off (Postrun) = True = False = False Is in range of 5..120 [s]	30 [s]	Once	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is a leak in the backup circuit.	Calculated leakage based on pressure sensor 1 value	> 200 [mm^3/s]	(Vehicle was driven above OR For time) AND Ignition state AND Braking is requested (either by driver or by external) AND Parking brake is being applied AND Parking brake is being released AND Vehicle stationary	> 8.95 [mph] > 30 [s] = Off (Postrun) = True = False = False Is in range of 5..120 [s]	30 [s]	Once	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is a leakage in the plunger or in the wheel circuits.	Calculated leakage based on pressure sensor 2 value	> 200 [mm^3/s]	BBF System state AND	= Full OR Degraded pedal feel	30 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
					Braking is requested (either by driver or by external) AND Pressure sensor 2 value AND For a number of brake events AND Brake duration	= True >= 7 [bar] >= 2 > 5 [s]			
Wheel Speed Sensor Signal Cross Coupled	C2A23	This monitoring checks if the wheel speed sensors at the Front Axle are mounted incorrectly or if the wheel speed sensors at the Front axle are swapped.	Integrated model yaw rate out of Front Axle Wheel Speed Sensors AND Integrated model yaw rate out of Steering Angle Sensor	< -90 [deg] > 90 [deg]	Ignition state AND Vehicle speed AND Curve driving	= On > 4.47 [mph] > 3 [deg/s]	30 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the wheel speed sensors at the Rear Axle are mounted incorrectly or if the wheel speed sensors at the Rear axle are swapped.	Integrated model yaw rate out of Rear Axle Wheel Speed Sensors AND Integrated model yaw rate out of Steering Angle Sensor	< -90 [deg] > 90 [deg]	Ignition state AND Vehicle speed AND Curve driving	= On > 4.47 [mph] > 3 [deg/s]	30 [s]	Continuous	Type C, No MIL, Emissions Neutral
System Voltage Low	P0562	This monitoring checks if the supply voltage is high enough for the actuation to be possible.	Power supply voltage	< 9 [V]	Actuation (apply or release) has been requested	= True	2 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if Power Supply via UBVR voltage is too low to perform robust motor test.	Measured UBVR voltage	< 8 [V]	Ignition state AND Only UBVR is used as redundant supply AND Normal initial motor test was successful	= On = True = False	Immediately	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is an undervoltage measured at UBB supply line.	Measured UBB voltage	< 9.8 [V]	Ignition state	= On	0.200 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is an undervoltage measured at UBB supply line.	Measured UBB voltage	< 8 [V]	Ignition state	= On	0.200 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is an undervoltage measured at UBB supply line.	Measured UBB voltage	< 6.5 [V]	Ignition state	= On	0.200 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if charge pump tests could not be executed because of undervoltage.	Charge pump tests could not be executed due to undervoltage AND For number of times	= True >= 3	Ignition state	= On	57 [s]	Cyclically in every 19 [s]	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is fast hydraulic hard undervoltage.	Overtemperature situation detected by system ASIC at external LiPS power supply line	= True	Ignition state	= On	0.060 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the power supply at valve path is below the hard undervoltage threshold.	UB_VR	< 6.2 [V]	Ignition state AND Standstill	= On = False	0.200 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the power supply at valve path is below the undervoltage threshold.	UB_VR	< 9.6 [V]	Ignition state AND Cold start cranking	= On = False	1 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is an existing overvoltage situation and this is only a replacement failure instead of other NET failures.	Network voltage AND Another NET failure has been detected	< 7.5 [V] = True	Ignition state	= On	Immediately	Continuous	Type C, No MIL, Emissions Neutral
Brake Booster Temperature Sensor "A" Circuit Low	P25C6	This monitoring checks if the BLM Temperature Signal 1 is shorted to Ground	BLM Temperature Signal 1 AND Times undervoltage detected	< 0.2 [V] >= 2	Ignition state	= On	0.600 [s]	Continuous	Type C, No MIL, Emissions Neutral
Brake Booster Temperature Sensor "A" Circuit High	P25C7	This monitoring checks if the BLM Temperature Signal 1 is shorted to Supply	BLM Temperature Signal 1 AND Times overvoltage detected	> 3.27 [V] >= 2	Ignition state	= On	0.600 [s]	Continuous	Type C, No MIL, Emissions Neutral
Lost Communication With Multi-axis Acceleration Sensor Module "A"	U0125	This monitoring checks if the message IMU_Yaw_Latitud_Acc_CE from IMU_CE is received within a time range.	Message is not received for time	> 0.100 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		This monitoring checks if the message IMU_Yaw_Long_Acc_CE is received within a time range.	Message is not received for time	> 0.100 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message PPEI_Long_Lat_Sensor_Data_CE from IMU_CE is received within a time range.	Message is not received for time	> 5 [s]	Communication related conditions are fulfilled	= True	5 [s]	Continuous	Type C, No MIL, Emissions Neutral
Lost Communication With Power Steering Control Module "A"	U0131	This monitoring checks if the message PPEI_Steering_Wheel_Angle_CE is received within a time range.	Message is not received for time	> 0.100 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral
Lost Communication With Body Control Module	U0140	This monitoring checks if the message Body_Information_2_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.500 [s]	Communication related conditions are fulfilled	= True	0.500 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message Body_Information_4_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message Body_Information_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.500 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.500 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message Immobilizer_Identifier_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.500 [s]	Communication related conditions are fulfilled	= True	0.500 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message Lighting_Customization_Rqst_1_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message PPEI_Brake_Apply_Status_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message PPEI_Gateway_LS_General_Info from BCM_HS is received within a time range.	Message is not received for time	> 1 [s]	Communication related conditions are fulfilled	= True	1 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message PPEI_Platform_Eng_Cntrl_Requests_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.63 [s]	Communication related conditions are fulfilled	= True	0.630 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message PPEI_Platform_General_Status_HS from BCM_HS is received within a time range.	Message is not received for time	> 0.500 [s]	Communication related conditions are fulfilled	= True	0.500 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message Tire_Pressure_Sensors_HS from BCM_HS is received within a time range.	Message is not received for time	> 2.5 [s]	Communication related conditions are fulfilled	= True	2.5 [s]	Continuous	Type C, No MIL, Emissions Neutral
Lost Communication With Restraints Control Module	U0151	This monitoring checks if the message IMU_Yaw_Latitud_Acc_CE from SDM_CE is received within a time range.	Message is not received for time	> 0.100 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message IMU_Yaw_Long_Acc_CE from SDM_CE is received within a time range.	Message is not received for time	> 0.100 [s]	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if the message PPEI_Long_Lat_Sensor_Data_CE from SDM_CE is received within a time range.	Message is not received for time	> 5 [s]	Communication related conditions are fulfilled	= True	5 [s]	Continuous	Type C, No MIL, Emissions Neutral
Lost Communication With Parking Assist Control Module "A"	U0159	This monitoring checks if the message APA_Autonomous_Braking_Req_CE from APA_CE is received within a time range.	Message is not received for time	> 0.250 [s]	Communication related conditions are fulfilled	= True	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
Invalid Data Received From ECM/PCM "A"	U0401	This monitoring checks if signal group or frame 'Electronic Shift Braking Request Alive Rolling Count' of the message ETRS_General_Request_2_HS message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'ETRS General Request 2 HS'	= True = received	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Electronic Shift Braking Request Protection Value' of the message ETRS_General_Request_2_HS checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	> 10	Communication related conditions are fulfilled AND New message 'ETRS General Request 2 HS'	= True = received	0.125 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is any error in the received 'Hill Descent Control Switch Status Alive Rolling Count' signal in message PPEI_Engine_Torque_Status_2 signal, or an invalid value is indicated.	Signal error counter value	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Engine Torque Status 2 HS'	= True = received	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is any error in the received 'Hill Descent Control Switch Status Protection Value' signal in message PPEI_Engine_Torque_Status_2 signal, or an invalid value is indicated.	Signal error counter value	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Engine Torque Status 2 HS'	= True = received	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if Engine Speed Status signal of message PPEI_Engine_General_Status_1_HS is set to a defined value.	Engine Speed Status signal is set to	= 1 or 2 or 3	Communication related conditions are fulfilled AND New message 'PPEI Engine General Status 1 HS'	= True = received	0.250 [s]	Continuous	Type C, No MIL, Emissions Neutral
Invalid Data Received From Power Steering Control Module "A"	U0420	This monitoring checks if signal group or frame 'Steering Wheel Angle Alive Rolling Count' of the message PPEI_Steering_Wheel_Angle_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame Steering Angle Sensor Checksum of the message PPEI_Steering_Wheel_Angle_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring strategy checks if the received signal StrWhAngMsk of message PPEI_Steering_Wheel_Angle_CE is invalid.	Failure counter value	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Steering Wheel Angle CE'	= True = received	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
Invalid Data Received From Multi-axis Acceleration Sensor Module "A"	U0432	This monitoring checks if signal group or frame 'Inertial Measurement Unit Rolling Count Primary' of the message IMU_Yaw_Latitud_Acc_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'IMU Yaw Latitud Acc CE'	= True = received	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame Inertial Measurement Unit Checksum Primary of the message IMU_Yaw_Latitud_Acc_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Inertial Measurement Unit Rolling Count Secondary' of the message IMU_Yaw_Long_Acc_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND Start Stop function is inactive	= True = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Inertial Measurement Unit Checksum Secondary' of the message IMU_Yaw_Long_Acc_CE	Calculated checksum does not match the received checksum (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND	= True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		checksum is received with the expected value.			Start Stop function is inactive	= True			
		This monitoring checks if signal group or frame 'Longitudinal/Lateral Acceleration Sensor Value Alive Rolling Count' of the message PPEI_Long_Lat_Sensor_Data_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 100 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Long Lat Sensor Data CE'	= True = received	2.5 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Longitudinal/Lateral Acceleration Sensor Checksum' of the message PPEI_Long_Lat_Sensor_Data_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 100 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Long Lat Sensor Data CE'	= True = received	2.5 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring strategy checks if the received signal IMUDataMsk of message IMU_Yaw_Long_Acc_CE is invalid.	Failure counter value	>= 10 (+2/step)	Communication related conditions are fulfilled) AND (New message 'IMU Yaw Latitud Acc CE' OR New message 'IMU Yaw Long Acc CE')	= True = received = received	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring strategy checks if the received signal IMUDataMsk of message IMU_Yaw_Long_Acc_CE is invalid.	Failure counter value	>= 10 (+2/step)	Communication related conditions are fulfilled	= True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
Invalid Data Received From Restraints Control Module	U0452	This monitoring checks if signal group or frame 'Inertial Measurement Unit Rolling Count Primary' of the message IMU_Yaw_Latitud_Acc_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'IMU Yaw Latitud Acc CE' AND Start Stop function is inactive	= True = received = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Inertial Measurement Unit Checksum Primary' of the message IMU_Yaw_Latitud_Acc_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'IMU Yaw Latitud Acc CE' AND Start Stop function is inactive	= True = received = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Inertial Measurement Unit Rolling Count Secondary' of the message IMU_Yaw_Long_Acc_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'IMU Yaw Long Acc CE' AND Start Stop function is inactive	= True = received = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Inertial Measurement Unit Checksum Secondary' of the message IMU_Yaw_Long_Acc_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 10 (+2/step)	Communication related conditions are fulfilled AND New message 'IMU Yaw Long Acc CE' AND Start Stop function is inactive	= True = received = True	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Longitudinal/Lateral Acceleration Sensor Value Alive Rolling Count' of the message	Message counter does not periodically change (failure counter value)	>= 100 (+2/step)	Communication related conditions are fulfilled AND	= True	2.5 [s]	Continuous	Type C, No MIL, Emissions Neutral

Component/ System	Fault Code	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Condition	Time Required	Frequency of Checks	MIL Illumination
		PPEI_Long_Lat_Sensor_Data_CE message counter is received with the expected value.			New message 'PPEI Long Lat Sensor Data CE'	= received			
		This monitoring checks if signal group or frame 'Longitudinal/Lateral Acceleration Sensor Checksum' of the message PPEI_Long_Lat_Sensor_Data_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 100 (+2/step)	Communication related conditions are fulfilled AND New message 'PPEI Long Lat Sensor Data CE'	= True = received	2.5 [s]	Continuous	Type C, No MIL, Emissions Neutral
Invalid Data Received From Parking Assist Control Module "A"	U045A	This monitoring checks if signal group or frame 'Automatic Park Assist Braking Request Rolling Count' of message APA_Autonomous_Braking_Req_CE message counter is received with the expected value.	Message counter does not periodically change (failure counter value)	>= 3 (+2/step)	Communication related conditions are fulfilled AND New message 'APA Autonomous Braking Req CE'	= True = received	0.200 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if signal group or frame 'Automatic Park Assist Braking Request Checksum' of message APA_Autonomous_Braking_Req_CE checksum is received with the expected value.	Calculated checksum does not match the received checksum (failure counter value)	>= 3 (+2/step)	Communication related conditions are fulfilled AND New message 'APA Autonomous Braking Req CE'	= True = received	0.200 [s]	Continuous	Type C, No MIL, Emissions Neutral
Control Module Input Power 1 Circuit	U3006	This monitoring checks if UBB supply line loss is detected and the UBVR is used as redundant power supply.	Loss of UBB external supply is detected	= True	Ignition state	= On	0.050 [s]	Continuous	Type C, No MIL, Emissions Neutral
		This monitoring checks if there is UBB supply line failure.	UBB supply line	< 1.5 [V]	Ignition state	= On	0.100 [s]	Continuous	Type C, No MIL, Emissions Neutral
Control Module Input Power 2 Circuit	U3007	This monitoring checks if UBVR supply line loss is detected and the UBB is used as a redundant power supply.	Loss of UBVR external supply is detected	= True	Ignition state	= On	0.010 [s]	Continuous	Type C, No MIL, Emissions Neutral

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 Stuck Low Detected	B2B0D	This monitoring checks if the hardwired Run/Crank analog signal matches the value of the Run/Crank Terminal Status message received from the ECM. This fault is set if the two signals do not match where the hardwired signal is set to INACTIVE while the serial data signal is set to ACTIVE.	Run/Crank Analog Signal State **AND** Run/Crank Terminal Status **AND** X **OUT OF** Y	<= 1.5V = ACTIVE = 80 = 100	ECM Timed Out	= FALSE	0.8 [Sec]	Type B 2 Trips
Ignition Switch Run/Start Position Circuit Stuck High Detected	B2B0E	This monitoring checks if the hardwired Run/Crank analog signal matches the value of the Run/Crank Terminal Status message received from the ECM. This fault is set if the two signals do not match where the hardwired signal is set to ACTIVE while the serial data signal is set to INACTIVE.	Run/Crank Analog Signal State **AND** Run/Crank Terminal Status **AND** X **OUT OF** Y	>=5.5V = INACTIVE = 80 = 100	ECM Timed Out	= FALSE	0.8 [Sec]	Type B 2 Trips
CGM System Voltage Low Detected	B2B11	This monitoring checks the two system battery voltage sensors and sets a fault if both are below 7.0V.	VBATT1 **AND** VBATT2 **AND** X **OUT OF** Y	< 7.0V < 7.0V = 1600 = 2000	BCM Timed Out **AND** System Power Mode	= FALSE != CRANK	1.6 [Sec]	Type C - No MIL
Bus-Off detected on the HS Primary bus (Bus A)	U2413	This fault is set if the HS Primary bus enters the Bus-Off state	Bus Off Event Occurred on HS Primary	= TRUE	Run/Crank Analog Signal State **OR** Comm Enable Hardwire Line **AND** System Voltage	>= 5.5V >= 4.5V > 5.5V	25[usec] for pass 10[usec] for fail	Type B 2 Trips
Bus-Off detected on the HS Primary Extension bus (Bus I)	U2414	This fault is set if the HS Primary Extension bus enters the Bus-Off state	Bus Off Event Occurred on HS Primary Extension	= TRUE	Run/Crank Analog Signal State **OR** Comm Enable Hardwire Line **AND** System Voltage	>= 5.5V >= 4.5V > 5.5V	25[usec] for pass 10[usec] for fail	Type B 2 Trips
Bus-Off detected on the Chassis Expansion bus (Bus E)	U2415	This fault is set if the Chassis Expansion bus enters the Bus-Off state	Bus Off Event Occurred on Chassis Expansion	= TRUE	Run/Crank Analog Signal State **OR** Comm Enable Hardwire Line **AND** System Voltage	>= 5.5V >= 4.5V > 5.5V	25[usec] for pass 10[usec] for fail	Type B 2 Trips

Component/System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Internal memory failure on the CGM Detected	B2B12	This monitoring checks whether a double bit ECC error has occurred in code flash or RAM. This fault is set if an ECC error has occurred.	ECC Error Detected	= TRUE	Guarded Read Flag	= FALSE	50ms	Type B 2 Trips
		This monitoring checks and sets a fault if a defect in the data flash (NVM) is detected.	NVM Fault Detected	= TRUE	N/A	N/A	1.5 us	
Microcontroller Performance Failure Detected	B2B13	This monitoring shall check whether the ALU in the microcontroller is functioning correctly by running an algorithm and checking the results against an expected value. If the result is incorrect the fault shall be set.	Test Result 1 **AND** Test Result 2	!= Expected Result 1 != Expected Result 2	N/A	N/A	1.5 us	Type B 2 Trips
		This monitoring shall check whether any clock monitoring interrupts have occurred. If any clock monitoring interrupts have occurred this fault shall be set.	Clock Monitoring Interrupt Occurred	= TRUE	N/A	N/A		
Loss of Communication with the ECM Detected	U18D5	This monitoring shall check a supervised message from the ECM to check the communication status. If the CGM has not received the supervised message from the ECM for 2.5x of its periodic rate, a secondary counter shall be enabled and decremented. When the secondary timer reaches zero, this fault shall be set if the message still has not been received.	Supervised Message has not been received in 62.5[ms] **THEN** Secondary Timer (4 sec)	= TRUE = 0 sec	Run/Crank Analog Signal State **AND** System Voltage	>= 5.5V >= 7V	4.0625 [sec]	Type B 2 Trips
Loss of Communication with the TCM Detected	U18D7	This monitoring shall check a supervised message from the TCM to check the communication status. If the CGM has not received the supervised message from the TCM for 2.5x of its periodic rate, a secondary counter shall be enabled and decremented. When the secondary timer reaches zero, this fault shall be set if the message still has not been received.	Supervised Message has not been received in 2.5[sec] **THEN** Secondary Timer (4 sec)	= TRUE = 0 sec	Run/Crank Analog Signal State **AND** System Voltage	= ACTIVE >= 7V	6.5 [sec]	Type B 2 Trips

Component/System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
Loss of Communication with the EBOOST_OBD Detected	U18DD	This monitoring shall check a supervised message from the EBOOST_OBD to check the communication status. If the CGM has not received the supervised message from the EBOOST_OBD for 2.5x of its periodic rate, a secondary counter shall be enabled and decremented. When the secondary timer reaches zero, this fault shall be set if the message still has not been received.	Supervised Message has not been received in 1.25[sec] **THEN** Secondary Timer (4 sec)	= TRUE = 0 sec	Run/Crank Analog Signal State **AND** System Voltage	= ACTIVE >= 7V	5.25 [sec]	Type B 2 Trips