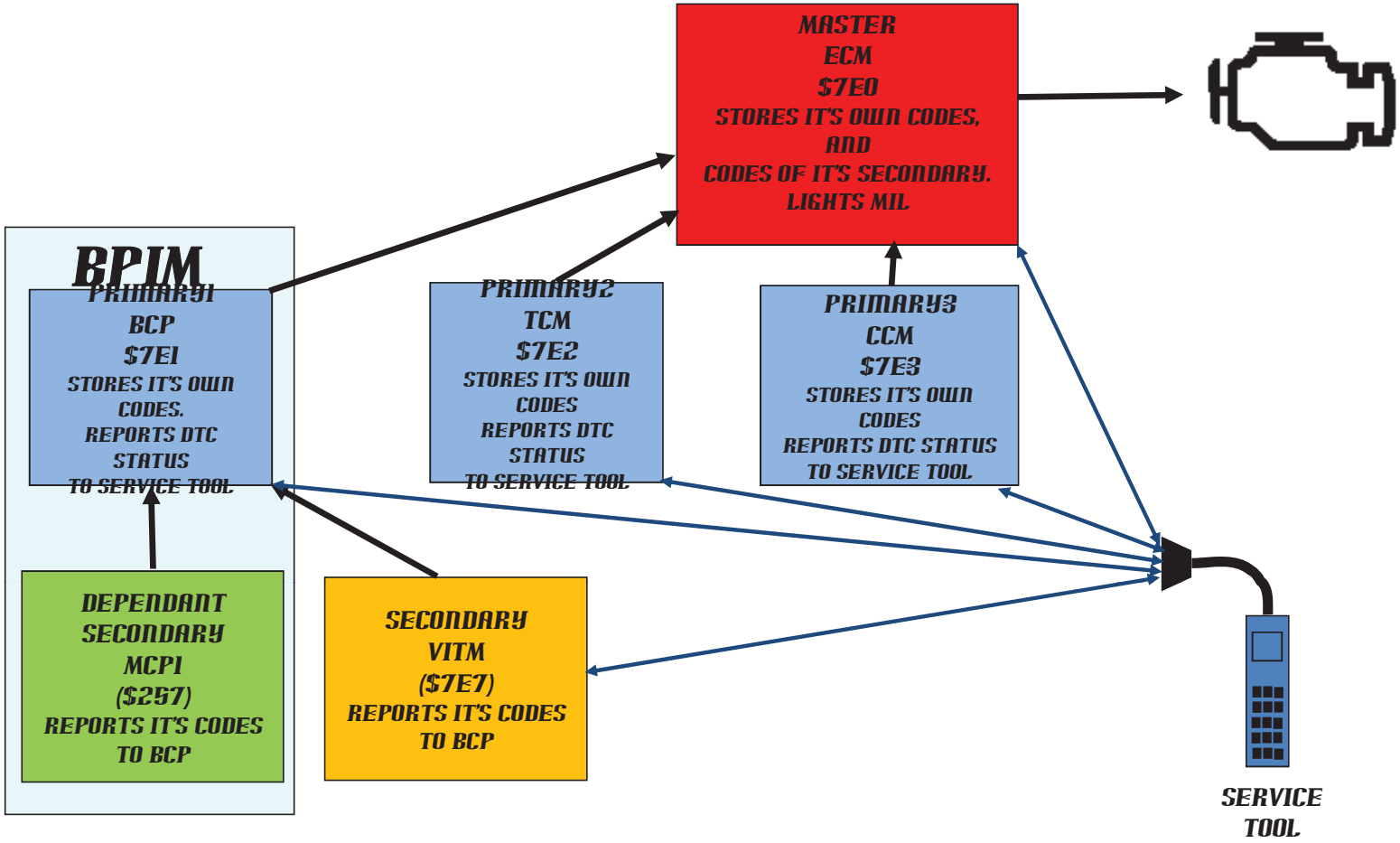
Distributed OBD2 Architecture for BAS +



MY12 BAS Plus XXXX Cert Application - There are many OBD Controllers represented:

Colors indicate the type of OBD controller.
Red = MASTER (ECM) - Stores Codes - Supports M01-0A - Controls MIL
Blue = PRIMARY (HPC1, TCM, FPCM, HPC2) - Stores Codes - Supports Modes 01, 04, 09, 0A
Orange = SECONDARY (BECM, BSCM) - Supports Modes 01, 04, 09, 0A
Green = DEPENDANT SECONDARY (MCPA, MCPB, ATPC, BCCM, EACCM)

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Power Moding Diagnostics								
System Voltage Low	P0562	Sets when the low voltage system voltage is below a threshold	Ignition Voltage	Ignition Voltage <= 10 Volts	Ignition Key Status Engine Speed	RUN/CRANK >= 0 RPM	5 seconds in a 6 second window	Special Type C
Ignition Switch Run/Start Position Circuit Low	P2534	Detects a run crank relay open circuit	Runk Crank Line voltage	Ignition Run Crank line voltage <= 2 Volts	CAN Communication ECM run crank active data U0100, U0073	enabled available and active NOT Fault Active	10 seconds (400 counts @ 25ms) in a 12.5 second window (500 counts @ 25ms)	One Trip, Type A
		DTC Pass	Run Crank Line Voltage	> 5 Volts			12.5 seconds (500 counts @ 25ms)	
Ignition Switch Run/Start Position Circuit High	P2535	Detects a run crank relay short to power	Runk Crank Line voltage	> 5 Volts	CAN Communication ECM run crank active data U0100, U0073	enabled available and false NOT Fault Active	10 seconds (400 counts @ 25ms) in a 12.5 second window (500 counts @ 25ms)	One Trip, Type A
		DTC Pass	Run Crank Line Voltage	Ignition Run Crank line voltage < 2V				
Transm'n Auxilary Oil Pump Diagnostics								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Auxiliary Transmission Fluid Pump Performance	P2797	This diagnostic monitors the aux pump performance based on Phase 1: Uses turbine speed profile to detect a malfunction with auxiliary pump. Tests entire hydraulic system. Will run every auto-stop/start. Phase 2: Will run during aborted auto-stop/start. Tests electrical integrity of auxiliary pump, wiring, and circuitry.	Phase 1: During auto-start, monitors turbine flare If flare > cal and ratio is achieved Phase 2: Intrusively enables pump on and off during aborted auto-stops monitors APM power loads to verify that pump is functional	Phase 1: Turbine Speed Slip > 150 rpm Phase 2: APM Delta PowerOFF > 250 Watts APM Delta Power ON <11 Watts	Phase 1: Auto-Stop	TRUE	7 counts	Two Trips, Type B
Transmission Auxillary pump circuit	P0B09	This DTC detects a open circuit on the Auxillary Pump circuit	The HWIO reports an invalid voltage (out of range) error flag	TRUE	Ignition Voltage Ignition Voltage	> 9 volts < 31 volts	>= 0.375s fail time out of 1.2s sample time	Type B Code two trips
Brake Pedal Position Sensor Diagnostics								
Brake Pedal Position Sensor Circuit Range/Performance	P057B	This diagnostic monitors the Brake Pedal Position Sensor for a stuck in range failure	Calculated brake pedal position difference is calculated, and a score is calculated from the table below x y 0.00 0.00 0.05 0.50 0.08 1.00 0.25 1.00 0.35 1.00 0.45 1.00 0.55 1.00 0.75 1.00 1.00 1.00		Run/Crank Voltage	> 10V	Each calculated difference test is a minimum of 12.5 seconds (1000 counts @ 12.5ms)	One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			This score is then applied to a total score, but is only allowed to affect the total score by a factor of 0.3		Brake Pedal Position Learn Active	FALSE	2 Full tests must be completed before a FAIL can be reported	
			Total score	≤ 0.40				
					12V Starter Motor	NOT engaged		
					P057C, P057D, P057E	NOT Fault Active		
					Complete Test Enable Criteria			
					Shift lever position	In PARK at least once this key on		
					Shift lever position	≠ PARK		
					P182E, P1915	NOT Fault Active		
					Vehicle Speed	≥ 5kph		
					P0722, P0723, P077C, P077D, U0101, U0073	NOT Fault Active		
					Accelerator Pedal Position	< 5%		
					P2122, P2123, P2127, P2128, P2138	NOT Fault Active		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Pass	Calculated brake pedal position difference is calculated, and a score is calculated from the table below x y 0.00 0.20 0.05 0.50 0.08 1.00 0.25 1.00 0.35 1.00 0.45 1.00 0.55 1.00 0.75 1.00 1.00 1.00				Each calculated difference test is a minimum of .625 seconds (50 counts @ 12.5ms)	
			This score is then applied to a total score, but is only allowed to affect the total score by a factor of 0.3				20 tests must be completed before a PASS can be reported	
			Total score	≥ 0.80				
Brake Pedal Position Sensor Circuit Low Voltage	P057C	This diagnostic monitors the Brake Pedal Position Sensor for a voltage stuck low failure	Brake Pedal Position Measured	< 6%	Run/Crank Voltage Brake Pedal Position Learn Active 12V Starter Motor	> 10V FALSE NOT engaged	62.5ms (5 counts @ 12.5ms) out of a 200ms window (16 counts @ 12.5ms)	Two Trips, Type B

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 Voltage	P057D	This diagnostic monitors the Brake Pedal Position Sensor for a voltage stuck high failure	Brake Pedal Position Measured	> 95%	Run/Crank Voltage	> 10V	125ms (10 counts @ 12.5ms) out of a 200ms window (16 counts @ 12.5ms)	Two Trips, Type B
					Brake Pedal Position Learn Active	FALSE		
Brake Pedal Position Sensor Circuit Erratic	P057E	This diagnostic monitors the Brake Pedal Position Sensor for a noisy/erratic failure	Brake Pedal Position Measured Delta Over 12.5ms (Loop to Loop)	> 6.5%	Run/Crank Voltage	> 10V	62.5 ms (5 counts @ 12.5ms) out of a 250ms window (20 counts @ 12.5ms)	Two Trips, Type B
					12V Starter Motor	NOT engaged		
					Brake Pedal Position Learn Active	FALSE		
5V Reference Diagnostics								
5V Reference 1Circuit	P0641	This diagnostic monitors the buffered 5V supply circuit 1	5V supply circuit measured percentage	X < 87.75% OR X > 92.25%	Run/Crank Voltage	> 10 volts	4 seconds	Two Trips, Type B
		DTC Pass	5V supply circuit measured percentage	87.75% < X < 92.25%			1 second	
5V Reference 2 Circuit	P0651	This diagnostic monitors the buffered 5V supply circuit 2	5V supply circuit measured percentage	X < 87.75% OR X > 92.25%	Run/Crank Voltage	> 10 volts	4 seconds	Two Trips, Type B
		DTC Pass	5V supply circuit measured percentage	87.75% < X < 92.25%			1 second	
5V Reference 3 Circuit	P0697	This diagnostic monitors the buffered 5V supply circuit 3	5V supply circuit measured percentage	X < 87.75% OR X > 92.25%	Run/Crank Voltage	> 10 volts	4 seconds	Two Trips, Type B
		DTC Pass	5V supply circuit measured percentage	87.75% < X < 92.25%			1 second	
Motor Generator System Diagnostics								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Failed AutoStart	P1A6F	This diagnostic indicates that the MGU was unable to start the ICE and the 12V conventional starter was used.	12V starter motor used for auto-start	TRUE			1 time	Two Trips, Type B
Drive Motor Performance	P0A90	This DTC detects a performance condition in the MGU to engine belt connection	Difference between MGU measured speed and ECM measured engine speed	> 1000 RPM	ECM Crank Sensor	NOT Fault Active	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	One Trip, Type A
					ECM Crank Sensor Measured Value	> 200rpm		
			OR		MGU Motor Speed	NOT Fault Active		
			Difference between MGU measured speed and ECM measured engine speed	> 500 RPM	P0C19, P1E0A, P0A3F, P0A40, P0B03, P0B0D, P0335, P0336	NOT Fault Active	1 count (@ 25ms) seen 10 separate times (7 seconds needed between counts). 10 counts must be seen on two successive key cycles with 1800 second soak time in between successive key cycles	
					Engine Speed CAN status	VALID		
					Hybrid Start State	Engine Starting State OR Engine Running State		
		DTC Pass	MGU calculated torque	≥ 20 NM OR ≤ -35 NM			1 second	
			AND					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Difference between MGU measured speed and ECM measured engine speed	≤ 500 RPM				
Controller Diagnostics								
Control Module Read Only Memory (ROM)	P0601	*This Diagnostic tests the checksum on ROM (flash) memory*						One Trip, Type A
		DTC Fail case 1: This DTC will be stored if any check sum in the boot is incorrect	Calculated Checksum does not match stored checksum				1 failure if it occurs during the first ROM test of the ignition cycle or 5 failures during background check Frequency: Runs continuously in the background after initial check	
		DTC Fail case 2: This DTC will be stored if any check sum in the calibration is incorrect					1 failure if it occurs during the first ROM test of the ignition cycle or 5 failures during background check Frequency: Runs continuously in the background after initial check	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 3: This DTC will be stored if any check sum in the software is incorrect					1 failure if it occurs during the first ROM test of the ignition cycle or 5 failures during background check Frequency: Runs continuously in the background after initial check	
		DTC Fail Case 4: This DTC will be stored if any chechsum in the Torque Security calibration is incorrect.	Calculated Checksum does not match calibrated checksum				1 failure if it occurs during the first ROM test of the ignition cycle or 5 failures during 12.5 msec loop Frequency: Runs continuously in the 12.5msec loop after initial check	
		DTC Fail case 5: This DTC will be stored if ECC fault was detected in Flash Memory	HWIO detect fault	= true			1 failure Frequency: Once at powerup	
Control Module	P0602	*This Diagnostic tests for whether a controller has been programmed*						One Trip,

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Not Programmed		DTC Fail case 1: Indicates that the BCP needs to be programmed	Fails if No Start Calibration is set to true which is only available on a new un-programmed BCP				Runs once at power up and excutes at every 1000ms	Type A
Control Module Long Term Memory Reset	P0603	*This Diagnostic tests for non-volatile memory errors*						One Trip, Type A
		DTC Fail case 1: Non-volatile memory (Static) checksum error at controller power-up	Checksum at power-up does not match checksum at power-down				1 failure Frequency: Once at powerup	
		DTC Fail case 2: Non-volatile memory (Preserved) checksum error at controller power-up						
		DTC Fail case 3: Non-volatile memory (BINVDM) checksum error at controller power-up						
		DTC Fail case 4: Non-volatile memory (ShutdownFinished) checksum error at controller power-up						
Control Module Random Access	P0604	*This Diagnostic tests that the RAM is functioning correctly*						One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Memory (RAM) Failure		DTC Fail case 1: The primary Ye variable does not match the redundant Ya variable Dual Store RAM	Ye variable	≠ Ya Variable	Ignition Status	= Run or Crank	Detects in 175ms	
		DTC Fail case 2:This is a background latency diagnostics to detect attempted write over locked memory location.	HWIO reports function trying to write to locked memory location	= TRUE			65534 failure counts Frequency: runs in background loop.	
		DTC Fail case 3: This case checks to see if fault flag ReMEMD_y_MainSOH_RAM_FltLtchd was previously retained from previous key cycle.	ReMEMD_y_MainSOH_RAM_FltLtchd	not = 0			Runs once at Initalization	
		DTC Fail case 4: Indicates that BCP is unable to correctly write and read data to and from System RAM	HWIO detects Fault	= true			1 failure Freqeuncy: Once at Power Up	
		DTC Fail case 5: Indicates that BCP is unable to correctly write and read data to and from Cache RAM	HWIO detects Fault	= true			1 failure Freqeuncy: Once at Power Up	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 6: Indicates that BCP is unable to correctly write and read data to and from eTPU RAM	HWIO detects Fault	= true			1 failure Freqeuncy: Once at Power Up	
Control Module Internal Performance	P0606	*This Diagnostic tests all the internal processor integrity subsystems*						One Trip, Type A
		DTC Fail case 1: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainDtctd SPI_Flt	HWIO detects Fault	= true (in SPI Hardware)	Run/Crank Voltage OR Powertrain Relay Voltage Powermoding	> 9.5 Volts = Accesory	28 fail counts out of 32 sample counts Executes in a 6.25ms loop Detects within 200ms	
		DTC Fail case 2: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_2ndNotRunningSeedKyTst	Key Value	is not an expected Key Value	SRAR shutdowns SPI Fault (P0606) RunCrank Active RAM or ROM fault 12V battery Seed received in wrong order fault Vehicle Speed Seed/Key Timeout Powermode	= False =False = False = false >11V = false <= 0 KPH = False = off for less than 5 seconds	Detects in 150ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 3: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_2ndFailsToTakeRmdlActn	IPT Detects faulty harware in Inhibit path IPT feedback	≠ expected feedback Value	HV Bat contactor Staus Available Inverter State HV Battery Contactors Motor Faults	= True = OFF >= 80 V = Closed = False (No Active DTCs: P0A1B, P0A3F, P0A40, P0A78, P0C01. P0C05, P0C0B, P0C19, P0C52, P0C53, P0C5C, P1A50, P1A51, P1ADE, P1AE9, P1AEC, P1AEE, P1B03, P1B0D, P1B11, P1E0A)	IPT Up down counter = 3	
					Motor Speed SRAR shutdowns SPI Fault RunCrank Active Ram or ROM fault 12V battery	<= 5 RPM = False =False (No Active P0606) = False = False (No Active DTCs: P0601, P0604, P1A51 or P1A50)		
		DTC Fail case 4: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_2ndRxIncorrectKeys	Key Value	≠ expected key Value	1, Number Of Secondary Processors to be Monitored 2. IPT status	1. > 0 2. = Not running for > 0.075s	Detects in 150ms or two consecutive faulty keys	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 5: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainDtctdSdKeyTimeout	seed does not update	in 500 msec	1. Number Of Secondary Processors to be Monitored 2. SPI faults 3. Seed/Key Init Delay 4.Run/Crank Voltage	1. > 0 2. = FALSE(No Active P0606) 3. > 1s 4. > 9.5	Detects in 500 msec	
		DTC Fail case 6: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainDtctdSdRxWrongOrdr	Seed sequence	≠ expected order	1. Number Of Secondary Processors to be Monitored 2. SPI faults 3.Run/Crank Voltage	1. > 0 2. = FALSE(No Active P0606) 3. > 9.5	12 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		DTC Fail case 7: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainSequenceFlt	Seed timeout PSW Fault	> 200 ms = True	1. Seed Update Key StoreFault Enable OR 2. Program Sequence Watch Enable	1. = True 2. = True	3 fail counts out of 4 sample counts Executes in a 50ms loop Detects in 200ms	
		DTC Fail case 8: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainALU_Flt	HWIO detects Fault	=2 (times in the same key cycle)	1. ALU Test Enabled 2. Code clear active 3. PMDR Run Crank Ignition Voltage	1. = TRUE 2. >= 0.15s 3. = False (No Active P2534)	runs continuously in 12.5ms loop Detects in 12.5ms	
		DTC Fail case 9: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainCfgRegFlt	HWIO detects Fault	=2 (times in the same key cycle)	1. Diagnostic Test Enabled 2. Code clear active 3. PMDR Run Crank Ignition Voltage	1. = TRUE 2. >= 0.15s 3. = False (No Active P2534)	runs continuously in 12.5ms loop Detects in 12.5ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 10: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainStack Flt	HWIO detects Fault	= 2 (Since Powerup)	Diagnostic Test Enabled	= True	Runs Continuously in 100ms loop Detects in 500ms	
		DTC Fail case 11: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_FlashECC _CktTest	HWIO detects Fault	= 3 /10 (Action: Turn On Mil) 5/10 (Action: Shutdown controller)	1. Flash ECC Circuit Test Enable 2. Power-Up Reset	1. = True 2. = True	3 fail counts out of 10 sample counts (turns on MIL) 5 fail counts out of 10 sample counts (shutdown vehicle) Executes once at every power up reset	
		DTC Fail case 12: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_RAM_ECC _CktTest	HWIO detects Fault	= 3 /10 (Action: Turn On Mil) 5/10 (Action: Shutdown controller)	1. RAM ECC Circuit Test Enable 2. Power-Up Reset	1. = True 2. = True	3 fail counts out of 10 sample counts (turns on MIL) 5 fail counts out of 10 sample counts (shutdown vehicle) Executes once at every power up reset	
		DTC Fail case 13: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_DMA_Xfer Test	HWIO detects Fault or Memory Copy Error	= True or =True	DMA Transfer Test Enabled	= TRUE	1 failure Executes Once at Power Up	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
ECU off timer diagnostic	P262B	This DTC detects an error in the ECU off timer IC chip reported time	Difference between timer reported time and previous reported time time	> 1.5 seconds	Run/Crank Active	FALSE	8 seconds (8 counts @ 1000ms) out of a 20 second window (20 counts @ 1000ms)	Two Trips, Type B
			OR					
			Timer calculated module off time outside of expected range	25% of expected module off time calculation				
Torque Security Diagnostics								
Internal Control Module Torque Calculation Performance	P061B	*This Diagnostic tests if the hybrid torque command can create an unintended acceleration/decelerration or wrong direction hazzard*						One Trip, Type A
		DTC Fail case 1: The Estimated output torque Commanded exceeds the upper torque limit To Max Fault	The Estimated output torque Commanded	> Maximum of either the drivers output torque request or zero plus .2g (87Nm)		Runs continuously when a torque source is present	30 fail counts out of 32 sample counts Executes in a 6.25ms loop Detects in 200ms	
		DTC Fail case 2: The Estimated output torque Commanded exceeds the lower torque limit To Min Fault	The Estimated output torque Commanded	< Minimum of either the drivers output torque request or zero minus .2g (132Nm)				
		DTC Fail case 3: The motor torque command exceeds the motor torque capacity Tm Cmd Fault	The Motor Torque command	>Maximum motor torque capacity plus .2g (36Nm) or less than the minimum torque capacity minus .2g (55Nm)				
Control Module Long	P062F	*This Diagnostic tests for unuseable BINVDM (flash) memory only*						One Trip,

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Term Memory Performance		DTC Fail case 1: Indicates that the NVM Error flag HWIO Bat Write will not succeed set DTC Fail case 2: Indicates that the NVM Error flag HWIO Assembly Cal set	Last EEPROM write did not complete		Ignition voltage Enable Cal	≥ 5 volts = True	1 failure Frequency: Once at power-up	Type A
Torque Management System – Forced Engine Shutdown	P06AF	*This Diagnostic checks that the ECM is still functioning correctly*						One Trip, Type A
		DTC Fail case 1: The main processor monitor ring compares the ECM 2nd pattern (nibble pattern) to known good pattern to determine ECM state of health.	The nibble pattern is incorrect	The pattern does not match (F, 5, B, D, A, 6, 3, 0)	Run/Crank Voltage	> 9.5 Volts	8 fail counts out of 12 sample counts Executes in a 12.5 ms Loop Detects in 200ms	
Alive Rolling Count Diagnostics								
Alive Rolling Count / Protection Value fault for the Engine Actual Torque Steady State	P15F0	*This Diagnostic checks for corruption in signals sent over CAN for the Engine Actual Torque Steady State*						One Trip, Type A
		DTC Fail case 1: Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the Engine Actual Torque Steady State	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1	Current ARC ≠ Previous ARC +1	Run Crank Active Run/Crank Voltage	True for > 0.5 seconds > 9.5V	10 fail counts out of 16 sample counts Executes in a 12.5 ms Loop Detects in 200ms	
			OR					
			The primary signal value does not equal the protection value	Primary Value ≠ Protection Value	Run Crank Active Run/Crank Voltage	True for > 0.5 seconds > 9.5V		
Alive Rolling Count / Protection Value fault for the Engine Actual Torque Steady State	P15F5	*This Diagnostic checks for corruption in signals sent over CAN for the Engine Crankshaft Torque Command*						One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 1: Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the Engine Crankshaft Predicted Torque Command	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1	Current ARC ≠ Previous ARC +1	Run Crank Active	True for > 0.5 seconds	10 fail counts out of 16 sample counts Executes in a 12.5 ms Loop Detects in 200ms	
		DTC Fail case 2: Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the Engine Crankshaft ImmediateTorque Command	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1	Current ARC ≠ Previous ARC +1	Run Crank Active	True for > 0.5 seconds	10 fail counts out of 16 sample counts Executes in a 12.5 ms Loop Detects in 200ms	
			OR					
			The primary signal value does not equal the protection value	Primary Value ≠ Protection Value				
Internal Control Module Redundant Memory Performance	P16F3	*Detect the dual store memory fault by comparing the primary value and the dual store value of the individual variables*						One Trip, Type A
		DTC Fail case 1: Detect the dual store memory fault by comparing the primary Ve signals and the We redundant signals	The primary value and the dual store value are not equal				10 Fail counts out of 16 Smpl counts, with a frequency of 12.5ms	
Communication Diagnostics								
Control Module Comm'n Bus A Off	U0073	*This diagnostic indicates a bus off condition on HSGMLAN (Bus A)*						Two Trips, Type B
		DTC Fail case 1: Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver	= bus-off state.	Run/Crank Voltage	> 9.5 Volts	4 fail counts out of 5 samples counts requires 112.5ms for each fail count to mature Detects in 450 ms	
					Power Mode	=RUN		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Stablization Timer	>=3 sec		
Control Module Comm'n Bus B Off	U0074	*This diagnostic indicates a bus off condition on the PTE (Bus B)*						Two Trips, Type B
		DTC Fail case 1: Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver	= bus-off state.	Run/Crank Voltage	> 9.5 Volts	4 fail counts out of 5 samples counts requires 112.5ms for each fail count to mature Detects in 450 ms	
					Power Mode	=RUN		
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Stablization Timer	>=3 sec		
Lost Comm'n With	U0100	*This diagnostic indicates a lost communication between the BCP and the ECM on Bus A*						Two

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
ECM/PCM on Bus A		DTC Fail case 1: Detects that CAN serial data communication has been lost with the ECM on Bus A	Missed ECM Messages		Run/Crank Voltage	> 9.5 Volts	Executes in a 6.25ms loop	Trips, Type B
							Detects in 500 ms	
					Power Mode	=RUN		
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Stablization Timer	>=3 sec		
Lost Comm'n With TCM	U0101	*This diagnostic indicates a lost communication between the BCP and the TCM on Bus A*						Two Trips, Type B
		DTC Fail case 1: Detects that CAN serial data communication has been lost with the TCM on Bus A	Missed TCM Messages		Run/Crank Voltage	> 9.5 Volts	Executes in a 6.25ms loop	
							Detects in 500 ms	
					Power Mode	=RUN		
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Stablization Timer	>=3 sec		
Lost Comm'n With	U1818	*This diagnostic indicates a lost communication between the BCP and the ECM on Bus B*						Two

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
ECM/PCM on Bus B		DTC Fail case 1: Detects that CAN serial data communication has been lost with the ECM on Bus B	Missed ECM Messages		Run/Crank Voltage	> 9.5 Volts	Executes in a 6.25ms loop	Trips, Type B
							Detects in 500 ms	
					Power Mode	=RUN		
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Stablization Timer	>=3 sec		
Lost com with Battery Energy Control Module on Bus B	U182A	*This diagnostic indicates a lost communication between the BCP and the BECM on Bus B*						Two Trips, Type B
		DTC Fail case 1: Lost Communication with Battery Energy Contorl Module on Bus B (BECM)	Missed BECM Messages		Run/Crank Voltage	> 9.5 Volts	Executes in a 6.25ms loop	
							Detects in 500 ms	
					Power Mode	=RUN		
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Stablization Timer	>=3 sec		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Control Module Calculated Hybrid Battery Voltage Performance	P1E3C	Redundant Bus Voltage monitor(The HV Bus voltage signal is processed twice in sw and the outputs are compaired)	Bus Voltage - Redundant Bus Voltage	> 1 V			2.5 seconds out of a 4 second window	One Trip, Type A
Control Module Calculated Hybrid Performance	P1E3D	Redundant Voltage monitor (The Pack voltage signal is processed twice in sw and the outputs are compaired)	Pack Voltage - Redundant Pack Voltage	> 1 V			40 Failures out of 195 Samples Frequency: 25ms	One Trip, Type A
Motor Generator Coolant Pump								
Drive Motor "A" Coolant Pump Control Circuit/Open	P0CC1	*This diagnostic detects open circuit failures on the Drive Motor "A" coolant pump control*						Two Trips, Type B
		Detects open circuit faults on control circuit of "Motor A" coolant pump	Drive Motor "A" Control HWIO Open Circuit Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	
					Drive Motor "A" Pump Control Enable	=FALSE		
					Drive Motor "A" Control HWIO Open Circuit Status Flag	≠ INDETERMINATE		
Drive Motor "A" Coolant Pump Control Circuit Range/Performance	P0CC2	*The purpose of this function is to detect and report a failure of the Drive Motor "A" Cooling System.*						Two Trips, Type B
		This diagnostic determines if the Drive Motor "A" cooling system is functioning as expected.	Rate of change of coolant temperature	<= 0.25 deg C / sec	RunCrank	=TRUE	20 sec after pump commanded on.	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					12V System Voltage	> 10V		
					Drive Motor "A" Pump Control Enable	=TRUE		
					Predicted delta between coolant temperature within Drive Motor "A" cooling jacket and the coolant at the Drive Motor "A" Coolant Temperature Sensor	> 17°C		
					DTCs are not ACTIVE	P0CC1 P0CC3 P0CC4 P0CBF POCBE P0CBD P0A2B P0A2C P0A2D		
Drive Motor "A" Coolant Pump Control Circuit Low	P0CC3	*This diagnostic detects short to ground circuit failure on the Drive Motor "A" coolant pump control output*						Two Trips, Type B
		Detects short to ground fault on control circuit of "Motor A" coolant pump	Drive Motor "A" Control HWIO Circuit Low Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	
					Drive Motor "A" Pump Control Enable	=FALSE		
					Drive Motor "A" Control HWIO Circuit Low Status Flag	≠ INDETERMINATE		
Drive Motor "A" Coolant Pump Control Circuit High	P0CC4	*This diagnostic detects short to voltage circuit failure on the Drive Motor "A" coolant pump control output.*						Two Trips, Type B
		Detects short to power fault on control circuit of "Motor A" coolant pump	Drive Motor "A" Control HWIO Circuit High Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	
					Drive Motor "A" Pump Control Enable	=TRUE		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Drive Motor "A" Control HWIO Circuit High Status Flag	≠ INDETERMINATE		
Motor Generator Coolant Temperature Sensor								
Drive Motor "A" Coolant Temperature Sensor Circuit High	P0CBF	*This diagnostic detects Out-of-Range High circuit failures of the coolant temperature sensor input.*						Two Trips, Type B
		This diagnostic detects Out-of-Range HIGH circuit failures of the Drive Motor "A" coolant temperature sensor input.	Raw temperature sensor input	> 176962 Ohms (-40 Deg C)	RunCrank	=TRUE	50 fails / 62 samples at 100ms loop rate	
					Raw temperature sensor input	> 100.9 Ohms (120 Deg C)		
Drive Motor "A" Coolant Temperature Sensor Circuit Low	P0CBE	*This diagnostic detects Out-of-Range Low circuit failures of the coolant temperature sensor input.*						Two Trips, Type B
		This diagnostic detects Out-of-Range Low circuit failures of the Drive Motor "A" coolant temperature sensor input.	Raw temperature sensor input	< 100.9 Ohms (120 Deg C)	RunCrank	=TRUE	50 fails / 62 samples at 100ms loop rate	
					Raw temperature sensor input	< 176962 Ohms (-40 Deg C)		
Drive Motor "A" Coolant Temperature	P0CBD	*The purpose of this diagnostic is to detect an irrational output signal from the Drive Motor "A" Cooling Loop temperature sensor.*						Two Trips,

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Sensor Performance		Drive Motor "A" Coolant Loop Temperature Sensor is not functioning as intended	Absolute difference between Drive Motor "A" Coolant Loop Temperature Sensor and average of Drive Motor "A" Stator, Engine Intake Air, and Transmission Oil temperatures	> 25°C	RunCrank	=TRUE	50 fails / 62 samples at 100ms loop rate	Type B
					DTCs are not ACTIVE	P0A2B P0A2C P0A2D P0CBF POCBE P0111 P0112 P0113 P0114 P0711 P0712 P0713 U0100 U0101		
					Diagnostic has not run this key cycle	=TRUE		
					Engine off Time	> 21600 sec		
Hood Switch Diagnostics								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Engine Hood Switch Performance	P257D	Rationality Check for the Vehicle Hood Switch	Hood Switch Position Sensor reading within an invalid range	Within the following ranges: 43.4% - 45.7%	Diagnostic Enabled Propulsion System Active	= TRUE =TRUE	6 failed samples within 8 samples 1 sample every 12.5ms	Two Trips, Type B
Engine Hood Switch Circuit Low Voltage	P257E	Detects if the Vehicle Hood Switch is Shorted to Ground	Hood Switch Position Sensor reading below a threshold	<17.2%	Diagnostic Enabled Propulsion System Active	=TRUE =TRUE	6 failed samples within 8 samples 1 sample every 12.5ms	Two Trips, Type B
Engine Hood Switch Circuit High Voltage	P257F	Detects if the Vehicle Hood Switch is Shorted to Battery	Hood Switch Position Sensor reading above a threshold	>67.8%	Diagnostic Enabled Propulsion System Active	=TRUE =TRUE	6 failed samples within 8 samples 1 sample every 12.5ms	Two Trips, Type B
Air Inlet Temperature Sensor (circuit is done in VITM)								
Hybrid Battery Pack Air Temperature Sensor Performance	P0AAD	*The purpose of this diagnostic is to detect an irrational output signal from the battery system inlet air temperature sensor.*						Two Trips, Type B
		Power Pack Inlet Air Temperature Sensor is not functioning as intended	Absolute difference between Hybrid Battery Pack Air Temperature Sensor and average battery core temperature	> 10°C	RunCrank	=TRUE	50 fails / 62 samples at 100ms loop rate	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					DTCs are not ACTIVE	U182A U0100 P262B P0AAF P0AAE P1A5D P0A9D P0AC7 P0ACC P0AEA P0BC4 P0C35 P0A9E P0AC8 P0ACD P0AEB P0BC5 P0C36 P0A9C P0AC6 P0ACB P0AE9 P0BC3 P0C34		
					Diagnostic has not run this key cycle	=TRUE		
					Engine off Time	> 21600 sec		
BPIM FAN								
Hybrid Battery Pack Cooling System Performance	P0C32	*This diagnostic uses a thermal model to predict the high voltage APM temperature and compares it to the actual measured temperature.*						Two Trips, Type B
		This diagnostic determines if the power pack cooling system is functioning properly	Absolute difference between 14V Power Module Temperature Sensor 1 and Modeled value of 14V Power Module Temperature Sensor 1	>15°C	RunCrank	=TRUE	1000 fails / 3000 samples at 100ms loop rate	
					DTCs are not ACTIVE	P0AAD P0AAE P0AAF U182A P0A84 P0A85 P0D65 P0D66 P1A90 P1A91 P1A92 P1AE8, P1AE9 P1AEC, P0A88 P0A89, P0CC5		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					14V Power Module Temperature Sensor 1	>-10°C		
					Hybrid Battery Pack Air Temperature Sensor	>-10°C		
					Power Pack Fan Percent Speed Command	>29%		
					14V Power Module Power	>0.1KW		
					Number of non-faulted battery cell temperatures	>=4		
					Propulsion system active time	>150s		
					14V Power Module Power has not changed more than over a time window of within the last	> 0.6 kW 30s 180s		
Power Pack Fan Control Output High Circuit	P0A85	*This diagnostic detects short to voltage circuit fault to the fan control output.*						Two Trips, Type B
		Detects short to power fault on control circuit of Power Pack Fan	Power Pack Fan Control Output High Circuit HWIO Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	
					Power Pack Fan Percent Speed Command	>10% AND <90%		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Power Pack Fan Control Output High Circuit HWIO Status Flag	≠Indeterminate		
Power Pack Fan Control Output Low Circuit	P0A84	*This diagnostic detects short to ground circuit fault to the fan control output.*						Two Trips, Type B
		Detects short to ground fault on control circuit of Power Pack Fan	Power Pack Fan Control Output Low Circuit HWIO Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	
					Power Pack Fan Percent Speed Command	>10% AND <90%		
					Power Pack Fan Control Output Low Circuit HWIO Status Flag	≠Indeterminate		
Power pack Fan Enable High Circuit	P0D66	*This diagnostic detects short to voltage circuit fault to the fan device enable.*						Two Trips, Type B
		Detects short to power fault on Enable circuit of Power Pack Fan	Power pack Fan Enable High Circuit HWIO Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	
					Power Pack Fan Enable	=FALSE		
					Power pack Fan Enable High Circuit HWIO Status Flag	≠Indeterminate		
Power pack Fan Enable Low Circuit	P0D65	*This diagnostic detects short to ground circuit fault to the fan device enable.*						Two Trips, Type B
		Detects short to ground fault on Enable circuit of Power Pack Fan	Power pack Fan Enable Low Circuit HWIO Status Flag	= FaultPresent	RunCrank	=TRUE	20 fails / 25 samples at 250ms loop rate	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Power Pack Fan Enable	=TRUE		
					Power pack Fan Enable Low Circuit HWIO Status Flag	≠Indeterminate		
Hybrid Battery Temperature Sensors								
Hybrid Battery Pack Over temperature	P0A7E	Battery temp. too high (Maximum of non-faulted temp sensors)	Max Battery Module Temperature	> 72.3 ºC	Temp Rationality FA (see BCP Fault Bundle Page)	= FALSE	50 Failures out of 60 Samples Frequency: 100ms	Two Trips, Type B
Hybrid Battery Temperature Sensor Range/Performance	P0A9C	Rationality compares temperature with the other sensor values read	Temperature input deviates from the average battery temperature	> 8.55 ºC	Temp Circuit FA (see BCP Fault Bundle Page) BCP Module Off Time BCP Module Off Time FA	= FALSE > 21600 sec = False	50 Failures out of 67 Samples Frequency: 100ms	Two Trips, Type B
Hybrid Battery 2 Temperature Sensor Performance	P0AC6	Rationality compares temperature with the other sensor values read	Temperature input deviates from the average battery temperature	> 8.55 ºC	Temp Circuit FA (see BCP Fault Bundle Page) BCP Module Off Time BCP Module Off Time FA	= FALSE > 21600 sec = False	50 Failures out of 67 Samples Frequency: 100ms	Two Trips, Type B
Hybrid Battery 3 Temperature Sensor Performance	P0ACB	Rationality compares temperature with the other sensor values read	Temperature input deviates from the average battery temperature	> 8.55 ºC	Temp Circuit FA (see BCP Fault Bundle Page) BCP Module Off Time	= FALSE > 21600 sec	50 Failures out of 67 Samples Frequency: 100ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					BCP Module Off Time FA	= False		
Hybrid Battery 4 Temperature Sensor Performance	P0AE9	Rationality compares temperature with the other sensor values read	Temperature input deviates from the average battery temperature	> 8.55 ºC	Temp Circuit FA (see BCP Fault Bundle Page) BCP Module Off Time BCP Module Off Time FA	= FALSE > 21600 sec = False	50 Failures out of 67 Samples Frequency: 100ms	Two Trips, Type B
Hybrid Battery Temperature Sensor E Circuit Range/Performance	P0BC3	Rationality compares temperature with the other sensor values read	Temperature input deviates from the average battery temperature	> 8.55 ºC	Temp Circuit FA (see BCP Fault Bundle Page) BCP Module Off Time BCP Module Off Time FA	= FALSE > 21600 sec = False	50 Failures out of 67 Samples Frequency: 100ms	Two Trips, Type B
Hybrid Battery Temperature Sensor F Range/Performance	P0C34	Rationality compares temperature with the other sensor values read	Temperature input deviates from the average battery temperature	> 8.55 ºC	Temp Circuit FA (see BCP Fault Bundle Page) BCP Module Off Time BCP Module Off Time FA	= FALSE > 21600 sec = False	50 Failures out of 67 Samples Frequency: 100ms	Two Trips, Type B
Hybrid Battery System Diagnostics								
Battery Module – resistance High EOL	P0A80	High Pack Resistance	Pack Resistance	> End Of Life Battery Resistance (ohm) (see BCP Supporting Tables)	Average Battery Temperature (Average of non-faulted temp sensors) Data sufficiently dispersed and symmetric	> -10 ºC = TRUE	600 Failures out of 750 Samples Frequency: 100ms	One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Battery State of Charge (SOC = Availabe Usable Energy / Total Usable Energy)	> 10 % < 90 %		
					Temp Rationality FA (see BCP Fault Bundle Page)	= FALSE		
Hybrid Battery Voltage Diagnostics								
Hybrid/EV Battery Voltage Balance Processor Multiplexer Performance	P1EAA	Cell Balance Resistor - Resistor Test. Function to rationalize that the circuit is not faulted	Circuit Key Off Test checks that when a cell's balancing resistor is activated that the cell's voltage moves more than: MUX Test expected Movment. Less than this cal will fail the diagnostic	< 0.1 V	RUN/CRANK Transitions to	= OFF	2 Failures out of 2 Samples, across key cycles	One Trip Type A
					Contactor Status	= Open		
					Test Active Bit Transitions to	= 1	Frequency: 25ms	
					Low Parasitic Mode (see BCP Fault Bundle Page)	= False		
			OR					
		Test Active Stuck On	Test active Bit (CAN signal that indicates when circuit is being tested)	= 1	RUN/CRANK	= TRUE for > 1200 samples	240 Failures out of 320 Samples	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Low Parasitic Mode (see BCP Fault Bundle Page)	= False	Frequency: 25ms	
			OR					
		Test Active Stuck Off	Test active Bit (CAN signal that indicates when circuit is being tested)	= 0 (for 400 samples)	RUN/CRANK Transitions to	= OFF for < 400 samples	2 Failures out of 2 Samples, across key cycles	
					Low Parasitic Mode (see BCP Fault Bundle Page)	= False	Frequency: 25ms	
Battery Energy Control Module Hybrid/EV Battery Cell Overvoltage	P1EAB	Voltage too high	Cell Voltage	> 4.35 V	No active DTC's:	P1EAC U182A	100 Failures out of 125 Samples Frequency: 25ms	One Trip, Type A
Hybrid/EV Battery Cell Overvoltage Signal/Circuit Performance	P1EAC	Over voltage circuit 2nd protection - Fault Flag Test Function to rationalize that the circuit is not faulted	Circuit Key Off Test counts (Hardware line is pulled down for 6 pulses from VITM and the BCP counts the rising and falling edges to determine the circuit key off test counts)	≠ 12	RUN/CRANK Transitions to	= OFF	2 Failures out of 2 Samples, across key cycles	One Trip Type A
					Test Active Bit Transitions to	= 1	Frequency: 25ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Low Parasitic Mode (see BCP Fault Bundle Page)	= False		
			OR					
		Test Active Stuck On	Test active Bit (CAN signal that indicates when circuit is being tested)	= 1	RUN/CRANK Low Parasitic Mode (see BCP Fault Bundle Page)	= TRUE for > 480 samples = False	240 Failures out of 320 Samples Frequency: 25ms	
			OR					
		Test Active Stuck Off	Test active Bit (CAN signal that indicates when circuit is being tested)	= 0 (for 400 samples)	RUN/CRANK Transitions to Low Parasitic Mode (see BCP Fault Bundle Page)	= OFF for < 400 samples = False	2 Failures out of 2 Samples, across key cycles Frequency: 25ms	
			OR					
		Enumeration Test	Enumerated Counter	≠ Expect Sequence	Low Parasitic Mode (see BCP Fault Bundle Page)	= False	6 Failures out of 12 Samples Frequency: 25ms	
Hybrid Battery Voltage Sense A Circuit Range/Performance	P0B3C	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense B Circuit Range/Performance	P0B41	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense C Circuit Range/Performance	P0B46	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense D Circuit Range/Performance	P0B4B	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense E Circuit Range/Performance	P0B50	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense F Circuit Range/Performance	P0B55	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense G Circuit Range/Performance	P0B5A	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense H Circuit Range/Performance	P0B5F	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense I Circuit Range/Performance	P0B64	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense J Circuit Range/Performance	P0B69	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense K Circuit Range/Performance	P0B6E	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense L Circuit Range/Performance	P0B73	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense M Circuit Range/Performance	P0B78	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense N Circuit Range/Performance	P0B7D	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense O Circuit Range/Performance	P0B82	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page)	= FALSE	20 Failures out of 40 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Average Cell Voltage Movement	> 0.045V	Frequency: 200ms	
Hybrid Battery Voltage Sense P Circuit Range/Performance	P0B87	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense Q Circuit Range/Performance	P0B8C	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense R Circuit Range/Performance	P0B91	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense S Circuit Range/Performance	P0B96	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense T Circuit Range/Performance	P0B9B	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense U Circuit Range/Performance	P0BA0	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense V Circuit Range/Performance	P0BA5	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense W Circuit Range/Performance	P0BAA	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense X Circuit Range/Performance	P0BAF	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense Y Circuit Range/Performance	P0BB4	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense Z Circuit Range/Performance	P0BB9	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AA Circuit Range/Performance	P1B16	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AB Circuit Range/Performance	P1B19	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page)	= FALSE	20 Failures out of 40 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Average Cell Voltage Movement	> 0.045V	Frequency: 200ms	
Hybrid Battery Voltage Sense AC Circuit Range/Performance	P1B1C	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AD Circuit Range/Performance	P1B1F	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AE Circuit Range/Performance	P1B22	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page) Average Cell Voltage Movement	= FALSE > 0.045V	20 Failures out of 40 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AF Circuit Range/Performance	P1B25	Rationality compares cell voltage to movement of other cell voltages. The cell under test must move at least 50% as much as the other cells	Individual Cell voltage movement	Not in same direction as the Average Cell Voltage Movement	Cell Voltage Circuit FA (see BCP Fault Bundle Page)	= FALSE	20 Failures out of 40 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Average Cell Voltage Movement	> 0.045V	Frequency: 200ms	
Battery Module – Over Voltage	P0AFB	Voltage too high	High Voltage Battery Pack Voltage	> Pack Over Voltage Thresh (V) (See BCP Supporting Tables)	No active DTCs:	P0ABC P0ABD P0AF8 P0ABB P1A5D U182A	320 Failures out of 1595 Samples Frequency: 25ms	One Trip, Type A
			OR					
			Any Cell Voltage	> Cell Over Voltage Thresh (V) (See BCP Supporting Tables)	Cell Voltage Rationality FA (see BCP Fault Bundle Page)	= FALSE	40 Failures out of 195 Samples Frequency: 25ms	
Battery Module – Under Voltage	P0AFA	Voltage too low	High Voltage Battery Pack Voltage	< Pack Under Voltage Thresh (V) (See BCP Supporting Tables)	No active DTCs:	P0ABC P0ABD P0AF8 P0ABB P1A5D U182A	320 Failures out of 1595 Samples Frequency: 25ms	One Trip, Type A
			OR					

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Any Cell Voltage	< Cell Under Voltage Thresh (V) (See BCP Supporting Tables)	Cell Voltage Rationality FA (see BCP Fault Bundle Page)	= FALSE	40 Failures out of 195 Samples Frequency: 25ms	
Hybrid Battery Pack Voltage Sense Circuit Rationality	P0ABB	Rationality compares pack voltage sensor to average cell voltage * 32	|Average cell voltage * 32 - Battery Pack voltage|	> 5.49 V	BCP Voltage FA (see BCP Fault Bundle Page)	= FALSE	20 Failures out of 100 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Pack Voltage Sense Circuit Correlation	P0AF8	Correlation compares pack voltage sensor to MCP Bus Voltage	|Battery Pack voltage - MCP Bus Voltage |	> 5.77 V	Main Contactor Status No active DTCs: MCP Bus Voltage FA	= Closed P0ABC P0ABD P0ABB P1A5D U182A = False	400 Failures out of 1995 Samples Frequency: 25ms	Two Trips, Type B
Hybrid Battery Positive Contactor								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
High Voltage System Interlock Circuit Low	P0A0C	DTC monitors the sensed voltage when the commanded voltage is high to determine if the circuit is faulty	HVIL Sensed % of Reference Voltage	<10%	HVIL Source Status	Sourced (5V)	2 failures out of 3 samples 12.5 ms /sample	Two Trip, Type B
					12V Battery Voltage	> 6V		
High Voltage System Interlock Circuit High	P0A0D	DTC monitors the sensed voltage when the commanded voltage is high to determine if the circuit is faulty	HVIL Sensed % of Reference Voltage	>90%	HVIL Source Status	Sourced (5V)	2 failures out of 3 samples 12.5 ms /sample	Two Trip, Type B
					12V Battery Voltage	>6V		
Hybrid Battery Positive Contactor Control Circuit Low	P0ADB	Diagnoses the Positive Contactor low side driver circuit for circuit faults.	Voltage low during driver off state (indicates short-to-ground or open circuit)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground Open Circuit: ≥ 200 K Ω impedance between signal and controller ground			3 failures out of 5 samples 50 ms /sample Continuous	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Positive Contactor Control Circuit High	P0ADC	Diagnoses the Positive Contactor low side driver circuit for circuit faults.	Voltage low during driver on state (indicates short to power)	Short to power ≤ 0.5 Ω impedance between signal and controller power			3 failures out of 5 samples 50 ms /sample Continuous	Two Trip, Type B
Hybrid Battery Precharge Contactor Control Circuit Low	P0AE6	Diagnoses the Precharge Contactor Control low side driver circuit for circuit faults.	Voltage low during driver off state (indicates short-to-ground or open circuit)	Short to ground: ≤ 0.5 Ω impedance between signal and controller ground Open Circuit: ≥ 200 K Ω impedance between signal and controller ground			3 failures out of 5 samples 50 ms /sample Continuous	Two Trip, Type B
Hybrid Battery Precharge Contactor Control Circuit High	P0AE7	Diagnoses the Precharge Contactor Control low side driver circuit for circuit faults.	Voltage low during driver on state (indicates short to power)	Short to power ≤ 0.5 Ω impedance between signal and controller power			3 failures out of 5 samples 50 ms /sample Continuous	Two Trip, Type B
Hybrid Battery System Precharge Time Too Short	P0C77	This DTC sets if Bus Voltage gets too high too fast during contactor precharge.	Bus Voltage / Battery Voltage	> 95% in less than 75 ms from the start of precharge	Battery Voltage DTC not active	P0ABC, P0ABD, P0ABB, P1A5D, or U182A	75 ms Executed Once Per Precharge Event	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Bus Voltage Bus Voltage DTC not active	< 40V before the start of precharge P1AE8, P1AE9, or P1AEC		
Hybrid Battery System Precharge Time Too Long	P0C78	This DTC sets if either the Bus Voltage does not get high enough in 1000 ms or battery current remains too high for too long after the contactor status changes from open to precharge	Bus Voltage / Battery Voltage	has not reached 95% in less than 1000 ms from the start of contactor precharge			1000 ms Executed Once Per Precharge Event	Two Trip, Type B
			or					
					Battery Current DTC not active	P0AC1, P0AC2, P1EBA, P1A07, P0B13, P0B10, P0B11, P1EBB, U182A		
			Battery Current	> 5 Amp for longer than 100 msec during contactor precharge			100 msec Executed Once Per Precharge Event	
Accessory Power Module Diagnostics								
Accessory Power Module Current Sensor Diagnostics								
14V Power Module Input Current Sensor Circuit Low Current	P0A88	This DTC detects a circuit low condition for the input current sensor on the Accessory Power Module	APM Input Current Sensor Measured Current	≤ 0.5A	Run/Crank Active	TRUE	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Calculated APM Output Power	0.25KW ≤ X ≤ 1.5KW		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
14V Power Module Input Current Sensor Circuit High Current	P0A89	This DTC detects a circuit high condition for the input current sensor on the Accessory Power Module	APM Input Current Sensor Measured Current	≥ 22.5A	Run/Crank Active	TRUE	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Calculated APM Output Power	≤ 1.5KW		
14V Power Module Output Current Sensor Circuit Low Current	P0C9E	This DTC detects a circuit low condition for the output current sensor on the Accessory Power Module	APM Output Current Sensor Measured Current	≤ 2A	Run/Crank Active	TRUE	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Calculated APM Input Power	0.25KW ≤ X ≤ 1.8KW		
14V Power Module Output Current Sensor Circuit High Current	P0C9F	This DTC detects a circuit high condition for the output current sensor on the Accessory Power Module	APM Output Current Sensor Measured Current	≥ 123A	Run/Crank Active	TRUE	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Calculated APM Input Power	≤ 1.25KW		
14 Volt Power Module Current Sensor AB Correlation	P0CC5	This DTC detects in range performance malfunctions of one or both APM current sensors	Difference between two calculated power signals below	> 0.4KW	Run/Crank Active	TRUE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Calculated APM Input Power multiplied by below efficiency table: X Y 0 .99 5 .95 10 .94 15 .93 20 .92 25 .91 30 .90		Run/Crank Voltage	9V ≤ X ≤ 32V		
					P1AE8, P1AE9, P1AEC	NOT Fault Active		
					P0A88, P0A89, P0C9E, P0C9F	NOT Fault Active		
					APM Output Commanded	TRUE		
Accessory Power Module Output Voltage Sensor Diagnostics								
14 Volt Power Module Step Down Voltage Performance	P0CA2	This DTC detects a shoot through fault in the APM	Silicon based power switching device failure detected	TRUE			25ms (1 count @ 25ms)	One Trip, Type A
		DTC Pass	Silicon based power switching device failure detected	FALSE			5 seconds	
APM Voltage low	P0A8D	This DTC detects a circuit low voltage condition in the APM low voltage sensor	APM low voltage sensor sensed value	≤ 1V	Run/Crank Active	TRUE	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
		DTC Pass	APM low voltage sensor sensed value	> 1.5V				
APM Voltage high	P0A8E	This DTC detects a circuit high voltage condition in the APM low voltage sensor	APM low voltage sensor sensed value	≥ 20V	Run/Crank Active	TRUE	1.5 seconds (60 counts @ 25ms) out of a 2 second window (80 counts @ 25ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Pass	APM low voltage sensor sensed value	< 19.5V				
APM Voltage performance	P0A8F	This DTC detects an in-range circuit performance condition in the APM low voltage sensor	Difference between APM low voltage sensor sensed value and Run/Crank low voltage sensed value	> 4.5V	Run/Crank Active	TRUE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					APM output commanded	TRUE		
Accessory Power Module Temperature Sensor Diagnostics								
14V Power Module Temperature Sensor 2 Performance	P1A71	This DTC detects an in-range circuit performance condition in the APM temperature sensor 2	Difference between APM Temperature Sensor 2 Measured Value and average of all three values below	≥ 20ºC	P1A90 Run This Key On	FALSE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
			APM Temperature Sensor 1 Measured Value		P1A71 Run This Key On	FALSE		
			MGU Temperature Sensor Measured Value		P0A2B Run This Key On	FALSE		
			Inverter Temperature Sensor Measured Value		P0AEE Run This Key On	FALSE		
					P1A90, P1A91, P1A92, P1A71, P1A72, P1A73, P0A2B, P0A2C, P0A2D, P0A2F, P0AEE, P0AEF, P0AF0, P0C11, P262B/ECM	NOT FA		
					Run/Crank Active	TRUE		
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Propulsion System Inactive Time	≥ 28,800 seconds		
14V Power Module Temperature Sensor 2 Circuit Low Voltage	P1A72	This DTC detects a circuit low voltage condition in the APM Temperature Sensor 2 Circuit	APM Temperature Sensor 2 Measured Value	≥ 145º	Run/Crank Active	TRUE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Pass	APM Temperature Sensor 2 Measured Value	< 140º				
14V Power Module Temperature Sensor 2 Circuit High Voltage	P1A73	This DTC detects a circuit high voltage condition in the APM Temperature Sensor 2 Circuit	APM Temperature Sensor 2 Measured Value	≤ -65ºC	Run/Crank Active	TRUE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
		DTC Pass	APM Temperature Sensor 2 Measured Value	> -60ºC				
14V Power Module Temperature Sensor 1 Performance	P1A90	This DTC detects an in-range circuit performance condition in the APM temperature sensor 1	Difference between APM Temperature Sensor 1 Measured Value and average of all three values below	≥ 20ºC	P1A90 Run This Key On	FALSE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
			APM Temperature Sensor 2 Measured Value		P1A71 Run This Key On	FALSE		
			MGU Temperature Sensor Measured Value		P0A2B Run This Key On	FALSE		
			Inverter Temperature Sensor Measured Value		P0AEE Run This Key On	FALSE		
					P1A90, P1A91, P1A92, P1A71, P1A72, P1A73, P0A2B, P0A2C, P0A2D, P0A2F, P0AEE, P0AEF, P0AF0, P0C11, P262B/ECM	NOT FA		
					Run/Crank Active	TRUE		
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Propulsion System Inactive Time	≥ 28,800 seconds		
14V Power Module Temperature Sensor 1 Circuit Low Voltage	P1A91	This DTC detects a circuit low voltage condition in the APM Temperature Sensor 1 Circuit	APM Temperature Sensor 2 Measured Value	≥ 145º	Run/Crank Active	TRUE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Pass	APM Temperature Sensor 2 Measured Value	< 140º				
14V Power Module Temperature Sensor 1 Circuit High Voltage	P1A92	This DTC detects a circuit high voltage condition in the APM Temperature Sensor 1 Circuit	APM Temperature Sensor 1 Measured Value	≤ -65ºC	Run/Crank Active	TRUE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
					Run/Crank Voltage	9V ≤ X ≤ 32V		
		DTC Pass	APM Temperature Sensor 1 Measured Value	> -60ºC				
High Voltage Isolation								
High Voltage Isolation Low Resolution Circuit								
Hybrid Battery Voltage Isolation Sensing Performance	P0AA8	This DTC detects an in-range performance problem with either mid-pack voltage sensor circuits	Absolute value of difference between MCP high voltage sensor value and sum of positive mid-pack voltage sensor value and negative mid-pack voltage sensor value	> 15V	Run/Crank Active	TRUE	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					P0AA9, P0AAA, P1E0D	NOT Fault Active		
					P1E0C	NOT Fault Active		
					P1AE8, P1AE9, P1AEC	NOT Fault Active		
Hybrid Battery Voltage Isolation Sensing Circuit 1 Low Voltage	P0AA9	This DTC detects a circuit low voltage condition in the positive mid-pack voltage sensor circuit	Negative mid-pack voltage measured value	< 5V	Run/Crank Active	TRUE	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					High voltage contactor status	= CLOSED		
					Active Isolation	INACTIVE		
Hybrid Battery Voltage Isolation Sensing Circuit 1 High Voltage	P0AAA	This DTC detects a circuit high voltage condition in the positive mid-pack voltage sensor circuit	Difference between negative mid-pack voltage measured value and MCP high voltage value	> 15V	Run/Crank Active	TRUE	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					P1AE8, P1AE9, P1AEC	NOT Fault Active		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Isolation Sensing Circuit 2 Low Voltage	P1E0C	This DTC detects a circuit low voltage condition in the negative mid-pack voltage sensor circuit	Negative mid-pack voltage measured value	< 5V	Run/Crank Active	TRUE	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					Active Isolation	INACTIVE		
					High Voltage Contactor Status	CLOSED		
Hybrid Battery Voltage Isolation Sensing Circuit 2 High Voltage	P1E0D	This DTC detects a circuit high voltage condition in the negative mid-pack voltage sensor circuit	Difference between negative mid-pack voltage measured value and MCP high voltage value	> 15V	Run/Crank Active	TRUE	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					P1AE8, P1AE9, P1AEC	NOT Fault Active		
Drive Motor "A" Control Module Hybrid Battery Voltage System Isolation Fault	P1AF0	This DTC detects an isolation problem in the high voltage DC system	HWIO calculated resistance between high voltage DC system and vehicle ground	< 225,600 ohms	P0AAA	NOT Fault Active	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					P1E0D	NOT Fault Active		
					P0AA8	NOT Fault Active		
					P1E10	NOT Fault Active		
					P1E13	NOT Fault Active		
					P1E11	NOT Fault Active		
					P1E14	NOT Fault Active		
					P1AE8, P1AE9, P1AEC	NOT Fault Active		
					MCP High Voltage Sensor Value	> 100V		
					Active Isolation Status	INACTIVE for 10 seconds		
High Voltage Isolation High Resolution Circuit								
Hybrid Battery Voltage Isolation High Resolution Sensing Circuit 1 Low Voltage	P1E0F	This DTC detects a circuit low voltage condition in the positive mid-pack high resolution voltage sensor circuit	Positive mid-pack high resolution voltage measured value	< 3V	High Voltage Contactor Status	CLOSED	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					Active Isolation	INACTIVE		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					High Voltage Contactor Status	CLOSED		
Hybrid Battery Voltage Isolation High Resolution Sensing Circuit 1 High Voltage	P1E10	This DTC detects a circuit high voltage condition in the positive mid-pack high resolution voltage sensor circuit	Difference between positive mid-pack high resolution voltage measured value and MCP high voltage measured value	> 5V	Run/Crank Active	TRUE	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					P0AAA	NOT Fault Active		
					P1AE8, P1AE9, P1AEC,	NOT Fault Active		
					Positive mid-pack voltage sensor value	< 7.5V		
Hybrid Battery Voltage Isolation High Resolution Sensing Circuit 1 Performance	P1E11	This DTC detects an in-range performance problem with the positive mid-pack high resolution voltage sensor circuit	Difference between positive mid-pack voltage sensor value and positive mid-pack high resolution voltage sensor value	> 3V			1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					P1E10, P1E0F	NOT Fault Active		
					Positive mid-pack voltage sensor value	< 7.5V		
					Active Isolation Status	INACTIVE		
Hybrid Battery Voltage Isolation High Resolution Sensing Circuit 2 Low Voltage	P1E12	This DTC detects a circuit low voltage condition in the negative mid-pack high resolution voltage sensor circuit	Negative mid-pack high resolution voltage sensor value	< 3V	High Voltage Contactor Status	CLOSED	1.5 seconds (120 counts @ 12.5ms) out of a 2 second window (160 counts @ 12.5ms)	Two Trips, Type B
					Active Isolation	INACTIVE		
					High Voltage Contactor Status	CLOSED		
Hybrid Battery Voltage Isolation High Resolution Sensing Circuit 2 High Voltage	P1E13	This DTC detects a circuit high voltage condition in the negative mid-pack high resolution voltage sensor circuit	Difference between negative mid-pack high resolution voltage measured value and MCP high voltage measured value	> 5V	Run/Crank Active	TRUE	75ms (6 counts @ 12.5ms) out of a 100ms window (8 counts @ 12.5ms)	Two Trips, Type B
					Negative mid-pack voltage sensor value	< 7.5V		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1E0D	NOT Fault Active		
					P1AE8, P1AE9, P1AEC	NOT Fault Active		
Hybrid Battery Voltage Isolation High Resolution Sensing Circuit 2 Performance	P1E14	This DTC detects an in-range performance problem with the negative mid-pack high resolution voltage sensor circuit	Difference between negative mid-pack voltage sensor value and negative mid-pack high resolution voltage sensor value	> 3V	P1E10	NOT Fault Active	75ms (6 counts @ 12.5ms) out of a 100ms window (8 counts @ 12.5ms)	Two Trips, Type B
					P1E12, P1E13	NOT Fault Active		
					Negative mid-pack voltage sensor value	< 7.5V		
					Active Isolation Status	INACTIVE		
Drive Motor Inverter Temperature Sensor (circuit diagnostics are done in MCP)								
Drive Motor Inverter Temperature Sensor A Circuit Range/Performance	P0AEE	This DTC detects an in-range circuit performance condition in the Inverter temperature sensor	Difference between Inverter Temperature Sensor Measured Value and average of all three values below	≥ 20ºC	P1A90 Run This Key On	FALSE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
			APM Temperature Sensor 2 Measured Value		P1A71 Run This Key On	FALSE		
			APM Temperature Sensor 1 Measured Value		P0A2B Run This Key On	FALSE		
			MGU Temperature Sensor Measured Value		P0AEE Run This Key On	FALSE		
					P1A90, P1A91, P1A92, P1A71, P1A72, P1A73, P0A2B, P0A2C, P0A2D, P0A2F, P0AEE, P0AEF, P0AF0, P0C11, P262B/ECM	NOT FA		
					Run/Crank Active	TRUE		
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Propulsion System Inactive Time	≥ 28,800 seconds		
Drive Motor Temperature Sensor (circuit diagnostics are done in MCP)								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Drive Motor Temperature Sensor Performance	P0A2B	This DTC detects an in-range circuit performance condition in the MGU temperature sensor	Difference between MGU Temperature Sensor Measured Value and average of all three values below	≥ 25ºC	P1A90 Run This Key On	FALSE	3.75 seconds (15 counts @ 250ms) out of a 5 second window (20 counts @ 250ms)	Two Trips, Type B
			APM Temperature Sensor 2 Measured Value		P1A71 Run This Key On	FALSE		
			APM Temperature Sensor 1 Measured Value		P0A2B Run This Key On	FALSE		
			Inverter Temperature Sensor Measured Value		P0AEE Run This Key On	FALSE		
					P1A90, P1A91, P1A92, P1A71, P1A72, P1A73, P0A2B, P0A2C, P0A2D, P0A2F, P0AEE, P0AEF, P0AF0, P0C11, P262B/ECM	NOT FA		
					Run/Crank Active	TRUE		
					Run/Crank Voltage	9V ≤ X ≤ 32V		
					Propulsion System Inactive Time	≥ 28,800 seconds		
High Voltage System Interlock Circuit								
High Voltage System Interlock Circuit 2 Low Voltage	P1B3F	This DTC detects a low voltage condition in the high voltage interlock circuit 2 circuit	High voltage interlock circuit 2 measured percentage of reference voltage	> 95%	Controller Awake Time	> 250ms	400ms (32 counts @ 12.5ms) out of a 500ms window (40 counts @ 12.5ms)	Two Trips, Type B
High Voltage System Interlock Circuit 2 High Voltage	P1B40	This DTC detects a high voltage condition in the high voltage interlock circuit 2 circuit	High voltage interlock circuit 2 measured percentage of reference voltage	< 5%	Controller Awake Time	> 250ms	400ms (32 counts @ 12.5ms) out of a 500ms window (40 counts @ 12.5ms)	Two Trips, Type B
High Voltage Discharge Circuit								
Hybrid Battery System Discharge Time Too Long	P0C76	High voltage bus discharge time too long	High Voltage Inverter Rationalized Voltage	> 65V after 6.5 seconds	High voltage contactor status	= OPEN	2 Failures out of 2 Samples	One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							Frequency: Runs Once per Key-Cycle	
Discharge Switch Circuit Open	P1A56	This circuit detects a failure in the active bus discharge circuit	High voltage bus delta 300ms after commanded discharge	< 18V	High voltage contactor status	= OPEN	1 failure	Two trips, Type B
			OR		High Voltage Bus Voltage	> 60V		
			Active bus discharge circuit status	= DISABLED			10 consecutive discharge attempts	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
MCP Phase Current Diagnostics								
Current Sensor Remedial Operation Mode: When a current sensor Ckt Hi, Ckt Lo, or prerformance fault (P0BE6, P0BE7, P0BE8, P0BEE, P0BEF, P0BF0, P0BFD) is present current control strategy enters an alternate control mode. This alternate control does not use the current sensors. The worst case to enter this altenate control is: 187.2 ms (worst case based on P0BFD time criteria)								
Drive Motor "A" Phase U-V-W Correlation	P0BFD	RationalitySum	Sum of Motor DC current and APM input current and battery pack current	>40 A	No Active Current Sensor DTC's	P0BE6, P0BE7, P0BE8, P0BEE, P0BEF, P0BF0	X: 90 ct Y: 96 ct R: 2.08 ms T: 187.2 ms	Two Trip, Type B
Drive Motor "A" Phase U-V-W Current Sensor Overcurrent	P0C01	To detect fast, repeated 3 Phase over currents and to protect IGBT. Retry description: Phase currents are monitored at the fastest loop rate (.083 - 0.5 ms). If fail threshold is exceeded, PWM is disabled for 1 2.08 ms loop and 1 fail count is recorded in the 2.08 ms loop. PWM is then re-enabled. DTC sets after 3rd unsuccessful retry	U or W Phase current sensor	> 396 A	No Active Current Sensor DTC's PWM Output Enable	P0BE6, P0BE7, P0BE8, P0BEE, P0BEF, P0BF0, P0BFD TRUE	X: 4 ct Y: 50 ct R: 2.08 ms T: 8.3 ms	Two Trip, Type B
Drive Motor "A" Phase U-V-W Circuit/Open	P0C05	Checks for minimum current in each phase when rotor position is near that peak's phase axis. Each phase is checked individually as rotor turns.	ABS(Peak Phase Axis Current)	< 9 A	Inverter State No Active Current Sensor DTC's High Voltage Rotor Position Current Commanded	ON P0BE6, P0BE7, P0BE8, P0BEE, P0BEF, P0BF0, P0BFD > 35V -30 deg < Phase Axis < +30 deg >= 25 A	X: 200 ct Y: N/A R: 0.11 - 0.5 ms T: 22 - 100 ms	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor "A" Phase U Current Sensor Circuit Low	P0BE7	Circuit Low monitor to detect the failure of U-phase current sensor circuit below valid range	U Phase current sensor output at highside	< -440 A	PWM Output Enable	FALSE	X: 4 ct Y: 6 ct R: 10.4 ms T: 41.6 ms	Two Trip, Type B
Drive Motor "A" Phase U Current Sensor Circuit High	P0BE8	Circuit High monitor to detect the failure of U-phase current sensor circuit above valid range	U Phase current sensor output at highside	> 440 A	PWM Output Enable	FALSE	X: 4 ct Y: 6 ct R: 10.4 ms T: 41.6 ms	Two Trip, Type B
Drive Motor "A" Phase U Current Sensor Offset Out-of Range	P0BE6	Offset Circuit monitor to detect the failure of U-phase offset current above valid range Offset Learn description: Offset learn is an 8 loop procedure that updates previous learned value using a first order lag filter on the new value. If filtered offset exceeds fail threshold for one loop the DTC sets	U Phase offset current output at highside	>30 A	PWM Output Enable No Active DTCs:	FALSE P0BE7/P0BE8	X: 1 to 8 ct Y: N/A R: 10.4 ms T: 10.4 to 83 ms	Two Trip, Type B
Drive Motor "A" Phase W Current Sensor Circuit Low	P0BEF	Circuit Low monitor to detect the failure of W-phase current sensor circuit below valid range	W Phase current sensor output at highside	< -440 A	PWM Output Enable	FALSE	X: 4 ct Y: 6 ct R: 10.4 ms T: 41.6 ms	Two Trip, Type B
Drive Motor "A" Phase W Current Sensor Circuit High	P0BF0	Circuit High monitor to detect the failure of W-phase current sensor circuit above valid range	W Phase current sensor output at highside	> 440 A	PWM Output Enable	FALSE	X: 4 ct Y: 6 ct R: 10.4 ms T: 41.6 ms	Two Trip, Type B
Drive Motor "A" Phase W Current Sensor Offset Out-of Range	P0BEE	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	W Phase offset current output at highside	>30 A	PWM Output Enable	FALSE	X: 1 to 8 ct Y: N/A R: 10.4 ms T: 10.4 to 83 ms	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		Offset Learn description: Offset learn is an 8 loop procedure that updates previous learned value using a first order lag filter on the new value. If filtered offset exceeds fail threshold for one loop the DTC sets			No Active DTCs:	P0BEF/P0BF0		
MCP IGBT Diagnostics								
Drive Motor "A" Inverter Performance	P0A78	Detects IGBT Desaturation Faults Monitors hw status line to detect internal overcurrent or undervoltage faults, or loss of switching control events	Phase A, B, or C High or Low Side Devices internal hw detection circuits: Desat: > ~2000A across switch Under voltage: HV < 50V Overcurrent: AC > 432A	OVERDRIVEN (Status Fault Bit)	Gate Drive Power Supply Ready Flag PWM Output Enable High Voltage	TRUE TRUE > 70V	X: 1 ct Y: N/A R: 2.08 ms T: 2.08 ms	Two Trip, Type B
Drive Motor "A" Inverter Power Supply Circuit/Open	P0C0B	Detects IGBT Bias Faults Monitors hw status line to detect loss of power supply to gate drive board	Phase A, B, or C Power Supply internal hw detection circuits: 5V power supply monitor: 5V < 3.5 - 4.3V 15V power supply monitor: 15V < 10.4 - 12.6V	FAILED (Status Fault Bit)	Gate Drive Power Supply Ready Flag RunCrank Voltage	TRUE > 7V	X: 10 ct Y: 12 ct R: 2.08 ms T: 20.8 ms	One Trip, Type A
MCP High Voltage (HV) Diagnostics								
Drive Motor "A" Hybrid Battery System Voltage High	P1AEE	To detect over voltage and to protect TPIM HV Circuit	HV Sensor Voltage or Hardware overvoltage Flag =	> 150 TRUE	RunCrank Voltage	> 7V	X: 9 cts R: 0.1 ms T: 0.9 ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor "A" Control Module Hybrid Battery Voltage Sense Circuit Low Voltage	P1AE8	Circuit Low monitor of HV output voltage sensor	HV Sensor Voltage	<30V	Run/Crank Status AND Contactor Status	= ACTIVE =Closed	X: 15 cts Y: 20 cts R: 10.4ms T: 156ms	Two Trips, Type B
Drive Motor "A" Control Module Hybrid Battery Voltage Sense Circuit High Voltage	P1AE9	Circuit High monitor of HV output voltage sensor	HV Sensor Voltage	>190 V	Run/Crank Status AND Contactor Status	= ACTIVE =Closed	X: 15 cts Y: 20 cts R: 10.4ms T: 156ms	Two Trips, Type B
Drive Motor "A" Control Module Hybrid Battery System Voltage	P1AEC	To check correlation of MCP Bus Voltage with sum of mid-pack voltages and Battery Pack Voltage.	ABS(MCP Bus Voltage - Battery Pack Voltage) AND ABS(MCP Bus Voltage - sum of mid-pack voltages) OR ABS(MCP Bus Voltage - sum of mid-pack voltages)	>= 15 V >= 10 V >= 10 V	HV circuit fault(P1AE8 and P1AE9) AND Battery Pack Voltage AND Run/Crank Status AND Contactor Status HV circuit fault(P1AE8 and P1AE9) AND Battery Pack Voltage AND Run/Crank Status AND Contactor Status	NOT ACTIVE Available and Valid = ACTIVE = Closed NOT ACTIVE Not Available or Not Valid = ACTIVE = Closed	X: 18 cts Y: 30 cts R: 10.4ms T: 187.2ms	Two Trips, Type B
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit Low	P1AF4	Circuit 1 Low monitor of Pos mid-pack voltage sensor	Pos mid-pack voltage	<5V	Run/Crank Status AND Contactor Status	= Active =Closed	X: 70 cts Y: 100 cts R: 10.4ms T: 728ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 1 Circuit High	P1AF5	Circuit 1 High monitor of Pos mid-pack voltage sensor	Pos mid-pack voltage - HV	>10 V	No HV circuit fault RunCrank	 Active	X: 70 cts Y: 100 cts R: 10.4ms T: 728ms	Two Trips, Type B
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit Low	P1B0B	Circuit 2 Low monitor of Neg mid-pack voltage sensor	Neg mid-pack voltage	<5V	Run/Crank Status AND Contactor Status	= ACTIVE =Closed	X: 70 cts Y: 100 cts R: 10.4ms T: 728ms	Two Trip, Type B
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor 2 Circuit High	P1B0C	Circuit 2 High monitor of Neg mid-pack voltage sensor	Neg mid-pack voltage - HV	>10 V	Run/Crank Status AND No HV circuit fault(P1AE8, P1AE9, P1AEC)	= ACTIVE None	X: 70 cts Y: 100 cts R: 10.4ms T: 728ms	Two Trip, Type B
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensing Performance	P1B41	To check correlation of sum of mid-pack voltages against MCP bus voltage and Battery Pack Voltage	ABS(Pos mid-pack - Neg mid-pack - Battery Pack Voltage) AND ABS(Pos mid-pack - Neg mid-pack - MCP bus voltage) OR	>= 15 V >= 10 V	Run/Crank Status AND Battery Pack Voltage AND MCP bus voltage circuit fault(P1AE8, P1AE9, P1AEC) AND Isolation Sense Circuit Faults(P1AF4, P1AF5, P1B0B, P1B0C)	= ACTIVE Available and Valid NOT ACTIVE NOT ACTIVE	X: 100 cts Y: 150 cts R: 10.4ms T: 1040ms	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
			ABS(Pos mid-pack - Neg mid-pack - MCP bus voltage)	>= 10 V	Run/Crank Status AND Battery Pack Voltage AND MCP bus voltage circuit fault(P1AE8, P1AE9, P1AEC) AND Isolation Sense Circuit Faults(P1AF4, P1AF5, P1B0B, P1B0C)	= ACTIVE Not Available OR Not Valid NOT ACTIVE NOT ACTIVE		
Drive Motor A Control Module Hybrid AC Voltage System Isolation Fault	P1B11	Detects an AC voltage short to chassis	AC component of Negative to Chassis voltage	>10V			X: 64 ct Y: 96 ct R: 2.08 ms T: 133.2 ms	One Trip, Type A
Motor A Temp Sensor Diagnostics								
Drive Motor "A" Control Module Temperature Sensor Circuit Out of Range High	P0A2D	To detect temperature sensor voltage Out of Range high.	Motor Temp	< -48 deg C	Motor Torque FOR Warm Up Time	>10Nm 90s	X: 100 cts Y: 150cts R: 10.4ms T: 1040ms	Two Trip, Type B
Drive Motor "A" Control Module Temperature Sensor Circuit Out of Range Low	P0A2C	To detect temperature sensor voltage Out of Range low.	Motor Temp	> 236 degC			X: 100 cts Y: 150cts R: 10.4ms T: 1040ms	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor "A" Over Temperature	P0A2F	To detect a sustained motor overtemperature condition	Motor Temperature exceeds inital fault threshold	> 165 deg C	Circuit Faults and Temp Performance Fault; P0A2B, P0A2D, P0A2C	NOT ACTIVE	X: 500cts Y: 1500cts R: 10.4ms T: 5200ms	Two Trip, Type B, Linear Torque Derate (100% to 0%)from 155C to 165C
Motor Control Processor Voltage Diagnostics								
Sensor Power Supply "A" Circuit Low	P06B1	Detects Sensor Power Supply (15V) below an acceptable threshold.	Scaled 15V Supply Voltage	< 9.7V			X: 40 ct Y: 50 ct R: 10.4 ms T: 416 ms OR continuous fail time > 300 ms	Two Trip, Type B
Sensor Power Supply "A" Circuit High	P06B2	Detects Sensor Power Supply (15V) above an acceptable threshold.	Scaled 15V Supply Voltage	> 18.0V			X: 40 ct Y: 50 ct R: 10.4 ms T: 416 ms OR continuous fail time > 300 ms	Two Trip, Type B
System Voltage Low	P1ADE	*This is the 12V system voltage low diagnostic*						Special Type C
		DTC Fail case 1: Sets when the ignition voltage is below a threshold	Ignition Voltage	<= 10 Volts	Enable Cal RunCrankActive Engine Speed	= true = true >= 0 RPM	5 fail counts out of 6 sample counts Executes in a 1000ms loop Detects in 6 sec	
Motor A Inverter Temp Sensor Diagnostics								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor Inverter Temperature Sensor A Circuit High	P0AF0	To detect Inverter A Temperature Sensor #1 voltage Out of Range high	PIM Temp A	< -70 deg C			X: 250 cts Y: 350 cts R: 10.4 ms T: 2600 ms	Two Trip, Type B
Drive Motor Inverter Temperature Sensor A Circuit Low	P0AEF	To detect Inverter A Temperature Sensor #1 Out of Range low (voltage)	PIM Temp A	> 150 degC			X: 250 cts Y: 350 cts R: 10.4 ms T: 2600 ms	Two Trip, Type B
Drive Motor "A" Inverter Over Temperature	P0C11	To detect an in-range overtemperature condition that can potentially damage inverter	PIM Temp A Temperature	> 118.2 deg C	Circuit Faults and Temp Performance Fault; P0AEE, P0AF0, P0AEF	NOT ACTIVE	X: 500 cts Y: 1500 cts	Two Trip, Type B
Motor A Resolver Sensors - Discrete Diagnostics								
The Resolver Discrete Diagnostics are a part of a Retry Strategy that allows for recovery from intermittent faults. There is a fast and slow fail to set a light based on DTC Type to warn the customer that the problem is regular and could get worse. The Fast fail is ~5 seconds of down time (5000 fail counts) out of a ~10 second period (10000 sample counts). The slow fail will allow 10 seconds (10000 counts) of fail time over a 30 minute period (900000 cnts)								
Drive Motor "A" Position Sensor Circuit	P0A3F	To detect Loss of Signal or converter error (line open, short) in the Motor Resolver circuit	Sin or Cos Signal	<2.3V	Resolver Initialization Delay	2ms	X: 70 Y: 100 R: 2 ms T: 140 ms	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor "A" Position Sensor Circuit Range/Performance	P0A40	To detect a Degradation of Signal fault in the angle data read by the Motor Resolver circuit.	Sin or Cos Signal	>4.0V	Resolver Initialization Delay	2ms	X: 70 Y: 100 R: 2 ms T: 140 ms	Two Trip, Type B
Drive Motor "A" Position Sensor Circuit Loss of Tracking	P1B03	To detect a Loss of Tracking fault in the Motor Resolver circuit.	Internal Tracking Error	> 5 deg	Resolver Initialization Delay	2ms	X: 70 Y: 100 R: 2 ms T: 140 ms	Two Trip, Type B
Drive Motor "A" Position Sensor Circuit Overspeed	P1B0D	To detect when Motor A has exceeded operational maximum speed	ABS(Motor speed)	>18000 rpm			X: 10 Y: 15 R: 10.4 ms T: 104 ms	Two Trip, Type B
Motor A Resolver Sensors - Circuit Diagnostics								
The Resolver Circuit Diagnostics are a part of a Retry Strategy that allows for recovery from intermittent faults. There is a fast and slow fail to set a light based on DTC Type to warn the customer that the problem is regular and could get worse. The Fast fail is ~5 seconds of down time (5000 fail counts) out of a ~10 second period (10000 sample counts). The slow fail will allow 10 seconds (10000 counts) of fail time over a 30 minute period (900000 cnts)								
Drive Motor "A" Position Sensor Circuit "A" Low	P0C52	To detect Resolver Circuit S1/3 Out of Range Low	Resolver S13 Circuit Reference Voltage	< 0.5 v			X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	Two Trip, Type B
Drive Motor "A" Position Sensor Circuit "A" High	P0C53	To detect Resolver Circuit S1/3 Out of Range High	Resolver S13 Circuit Reference Voltage	> 4.5 v			X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	Two Trip, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor "A" Position Sensor Circuit "B" Low	P0C5C	To detect Resolver Circuit S2/4 Out of Range Low	Resolver S24 Circuit Reference Voltage	< 0.5 v			X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	Two Trip, Type B
Drive Motor "A" Position Sensor Circuit "B" High	P0C5D	To detect Resolver Circuit S2/4 Out of Range High	Resolver S24 Circuit Reference Voltage	> 4.5 v			X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	Two Trip, Type B
MCPA Controller Fault Diagnostics								
Control Module Read Only Memory (ROM)	P1A51	*This Diagnostic tests the checksum on ROM (flash) memory*						One Trip, Type A
		DTC Fail case 1: This DTC will be stored if any check sum in the boot is incorrect	Calculated Checksum does not match stored checksum				1 failure if it occurs during the first ROM test of the ignition cycle or 5 failures during background check Frequency: Runs continuously in the background after initial check	
		DTC Fail case 2: This DTC will be stored if any check sum in the calibration is incorrect						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 3: This DTC will be stored if any check sum in the software is incorrect						
		DTC Fail Case 4: This DTC will be stored if any chechsum in the Torque Security calibration is incorrect.	Calculated Checksum does not match calibrated checksum				1 failure if it occurs during the first ROM test of the ignition cycle or 5 failures during 12.5 msec loop Frequency: Runs continuously in the 12.5msec loop after initial check	
		DTC Fail case 5: This DTC will be stored if ECC fault was detected in Flash Memory	HWIO detect fault	= true			5 failures Frequency: Once at powerup	
Control Module Random Access Memory (RAM) Failure	P1A50	*This Diagnostic tests the checksum on RAM memory*						One Trip, Type A
		DTC Fail case 1: The primary Ye variable does not match the redundant Ya variable Dual Store RAM	Ye variable	≠ Ya Variable			Detects in 175ms	
		DTC Fail case 2:This is a background latency diagnostics to detect attempted write over locked memory location.	HWIO reports function trying to write to locked memory location	= TRUE			65534 failure counts Frequency: runs in background loop.	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 3: This case checks to see if fault flag ReMEMD_y_MainSOH_RAM_FltLtchd was previously retained from previous key cycle.	ReMEMD_y_MainSOH_RAM_FltLtchd	not = 0			Runs once at Initalization	
		DTC Fail case 4: Indicates that BCP is unable to correctly write and read data to and from System RAM	HWIO detects Fault	= true			1 failures Freqeuncy: Once at Power Up	
		DTC Fail case 5: Indicates that BCP is unable to correctly write and read data to and from Cache RAM	HWIO detects Fault	= true			1 failures Freqeuncy: Once at Power Up	
		DTC Fail case 6: Indicates that BCP is unable to correctly write and read data to and from eTPU RAM	HWIO detects Fault	= true			1 failure Freqeuncy: Once at Power Up	
Drive Motor A Control Module Long Term Memory Reset	P1EB6	*This Diagnostic tests for non-volatile memory errors*						One Trip, Type A
		DTC Fail case 1: Non-volatile memory (Static) checksum error at controller power-up	Checksum at power-up does not match checksum at power-down				1 failure Frequency: Once at powerup	
		DTC Fail case 2: Non-volatile memory (Preserved) checksum error at controller power-up						
		DTC Fail case 3: Non-volatile memory (BINVDM) checksum error at controller power-up						
		DTC Fail case 4: Non-volatile memory (ShutdownFinished) checksum error at controller power-up						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Control Module Internal Performance	P0A1B	*This Diagnostic tests all the internal processor integrity subsystems*						One Trip, Type A
		DTC Fail case 1: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainDtctdSPI_Flt	HWIO detects Fault	= true (in SPI Hardware)	Run/Crank Voltage OR Powertrain Relay Voltage Powermoding	> 9.5 Volts = Accesory or Off	28 fail counts out of 32 sample counts Executes in a 6.25ms loop Detects in 200ms	
		DTC Fail case 2: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_2ndNotRunningSeedKyTst	Key Value	is not an expected Key Value	SRAR shutdowns SPI Fault RunCrank Active RAM or ROM fault 12V battery Seed received in wrong order fault Vehicle Speed Seed/Key Timeout Powermode	= False = False (No Active P0606) = False = false (no Active P0601, P0604, P1A50 or P1A51) >11V = false (No active P0606) <= 0 KPH = False = off for less than 5	Detects in 150ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 3: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_2ndFailsToTakeRmdlActn	IPT Detects faulty harware in Inhibit path IPT feedback	≠ expected feedback Value	HV Bat contactor Staus Available Inverter State HV Battery Contactors Motor Faults	= True = Off >= 80 V = Closed = False (No Active DTCs: P0A1B, P0A3F, P0A40, P0A78, P0C01. P0C05, P0C0B, P0C19, P0C52, P0C53, P0C5C, P1A50, P1A51, P1ADE, P1AE9, P1AEC, P1AEE, P1B03, P1B0D, P1B11, P1E0A)	IPT Fail counter >= 3	
					Motor Speed SRAR shutdowns SPI Fault RunCrank Active Ram or ROM fault	<= 5 RPM = False =False (No Active P0606) = False = false (No Active DTCs: P0601, P0604, P1A51 or P1A50)		
					12V battery Seed received in wrong order fault Vehicle Speed Seed/Key Timeout Powermode	>11V = false <= 0 MPH = False = off for less than 5 seconds		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 4: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_2ndRxIncorrectKeys	Key Value	≠ expected key Value	1. Number Of Main processors to be monitored 2. IPT status 3. SPI Fault 4. Run /Crank Voltage	1. > 0 2. = Not running 3. = False (No Active P0606) 4. > 9.5V	Detects in 150ms or two consecutive faulty keys	
		DTC Fail case 5: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainDtctdSdKeyTimeout	seed does not update	in 500 msec	1. Number Of Main processors to be monitored 2. SPI faults 3. Seed/Key Init Delay 4.Run/Crank Voltage	1. > 0 2. = FALSE (No Active P0606) 3. > 1s 4. > 9.5	Detects in 500msec	
		DTC Fail case 6: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainDtctdSdRxWrongOrdr	Seed sequence	≠ expected order	1. Number Of Main processors to be monitored 2. SPI faults 3.Run/Crank Voltage	1. > 0 2. = FALSE (No Active P0606) 3. > 9.5	12 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		DTC Fail case 7: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainSequenceFlt	Seed timeout PSW Fault	> 200 ms = True	1. Seed Update Key StoreFault Enable OR 2. Program Sequence Watch Enable	1. = True 2. = True	3 fail counts out of 4 sample counts Executes in a 50ms loop Detects in 200ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 8: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainALU_Flt	HWIO detects Fault	=2 (times in the same key cycle)	1. ALU Test Enabled 2. PMDR Run Crank Ignition Low Voltage P2534	1. = TRUE 2. = False	runs continuously in 12.5ms loop Detects in 12.5ms	
		DTC Fail case 9: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainCfgReg Flt	HWIO detects Fault	=2 (times in the same key cycle)	1. Configuration Register Test Enabled 2. PMDR Run Crank Ignition Low Voltage P2534	1. = TRUE 2. = False	runs continuously in 12.5ms loop Detects in 12.5ms	
		DTC Fail case 10: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainStackFlt	HWIO detects Fault	= 2 (Since Powerup)	Stack Test Enabled	= True	Runs Continuously in 100ms loop Detects in 200ms	
		DTC Fail case 11: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_MainADC_Flt	Continuous Fault	> 200ms	1. A2D Converter Test Enabled 2. Run Crank Voltage	1. = TRUE 2. > 7	3 fail counts out of 4 sample counts Executes in a 50ms loop Detects in 200ms	
		DTC Fail case 12: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_FlashECC_CktTest	HWIO detects Fault	= 3 /10 (Action: Turn On Mil) = 5/10 (Action: Shutdown controller)	1. Flash ECC Circuit Test Enable 2. Power-Up Reset	1. = True 2. = True	3 fail counts out of 10 sample counts (turns on MIL) 5 fail counts out of 10 sample counts (shutdown vehicle) Executes once at every power up reset	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 13: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_RAM_ECC_CktTest	HWIO detects Fault	= 3 /10 (Action: Turn On Mil) = 5/10 (Action: Shutdown controller)	1. RAM ECC Circuit Test Enable 2. Power-Up Reset	1. = True 2. = True	3 fail counts out of 10 sample counts (turns on MIL) 5 fail counts out of 10 sample counts (shutdown vehicle) Executes once at every power up reset	
		DTC Fail case 14: Indicates that the BCP has detected an internal processor integrity fault CePISR_e_DMA_XferTest	HWIO detects Fault or Memory Copy Error	= True or =True	DMA Transfer Test Enabled	= TRUE		
MCPA Torque Security Diagnostics								
Control Module Long Term Memory Performance	P1ADC	*This Diagnostic tests for unuseable BINVDM (flash) memory only*						One Trip, Type A
		DTC Fail case 1: Indicates that the NVM Error flag HWIO Bat Write will not succeed set	Last EEPROM write did not complete		Ignition voltage	≥ 5 volts	1 failure Frequency: Once at power-up	
		DTC Fail case 2: Indicates that the NVM Error flag HWIO Assembly Cal set						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Drive Motor A Torque Delivered Performance	P0C19	*This Diagnostic tests that the difference between the motor A torque command slew and the motor torque achieved is greater than a threshold.*						Two Trip, Type B
		Detects Motor torque command vs. torque achieved errors	ABS(filtered motor torque command)- calc motor torque achieved)	> 36 Nm	Inverter State No Active Current Sensor DTC's No Active HV Sensor DTC's No Active Motor Speed DTC's No Active Motor Position Sensor DTC's	Run P0BFD, P0BE6, P0BE7, P0BE8, P0BEE, P0BEF, P0BF0 P1AE8, P1AE9, P1AEC P1B0D P0C52, P0C53, P0C5C, P0C5D, P0A3F, P1B03, P0A40	X: 30 ct Y: 32 ct R: 2.08 ms T: 62.4 ms	
Drive Motor A Control Module Internal Control Module Torque Calculation Performance	P1E0A	*This diagnostic detects the torque command path calculation errors*						One Trip, Type A
		DTC Fail case 1: If the difference between the Torque achieved primary path signal and the redundant path signal is greater than a threshold (MTQR)	Difference between Primary and Redundant signals	> 36Nm	Inverter State	On	20 fail counts out of 32 sample counts Executes in a 6.25 ms Loop Detects in 125ms	
		DTC Fail case 2: If the difference between the Torque Commanded primary path signal and the redundant path signal is greater than a threshold (MTDR)	Difference between Primary and Redundant signals	> 36Nm	Inverter State	On		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 3: Compares the ISSD primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MCUR)	Difference between Primary and Redundant signals	> 120A	Inverter State	On		
		DTC Fail case 4: Compares the ISSQ primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MCUR)	Difference between Primary and Redundant signals	> 121A	Inverter State	On		
		DTC Fail case 5: Compares the ISSCmd primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MCDR)	Difference between Primary and Redundant signals	> 50A	Inverter State	On		
		DTC Fail case 6: Compares the BEMF Dec primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MCDR)	Difference between Primary and Redundant signals	> .0065210Nm	Inverter State	On		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 7: Compares the Usdq Limited primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MCCR)	Difference between Primary and Redundant signals	> .5V	Inverter State	On		
		DTC Fail case 8: Compares the Primary Path calculated Duty Cycle for three phase circuit signal in task 0 rate with the redundant signal calculated in 6.25ms and fails if it is greater than a threshold (SVMR)	For Modulate Control: Mod Index Square: or Perfect Square: For Linear Control: Mod Index Square: or Perfect Square:	 > 0.7 % > 0.3 % > 1.0 % > 0.1 % > 0.1 % > 1.0 %	Inverter State	On		
		DTC Fail case 9: Compares the Power Input Watts primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (HVTR)	Difference between Primary and Redundant signals	>3403 W	Inverter State	On		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
		DTC Fail case 10: Compares the VDC Adapt primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (HVTR)	Difference between Primary and Redundant signals	> .217V	Inverter State	On		
		DTC Fail case 11: Compares the Reactive Power primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (HVTR)	Difference between Primary and Redundant signals	> 10000000 W	Inverter State	On		
		DTC Fail case 12: Compares the Motor Speed primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MSPR)	Difference between Primary and Redundant signals	>140RadPerSec	Inverter State	On		
		DTC Fail case 13: Compares the Slip Frequency primary path calculated signal in task 0 rate with redundant signal calculated in 6.25ms and fails if it is different than a threshold (MCDR)	Difference between Primary and Redundant signals	>100RadPerSec	Inverter State Active Current Sensor DTC's	On P0BFD, P0BE6, P0BE7, P0BE8, P0BEE, P0BEF, or P0BF0		
Communication Diagnostics								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
Lost Comm'n With ECM/PCM on Bus A	U1876	*This diagnostic indicates a lost communication between the MCPA and the ECM on Bus A*						Two Trip, Type B
		DTC Fail case 1: Detects that CAN serial data communication has been lost with the ECM on Bus A	Missed ECM Messages		Run/Crank Voltage PowerMode Normal Communication Enabled Normal Message Transmission Diagnostic Enable Timer	> 9.5 Volts =RUN =TRUE =TRUE >=3 sec	Executes in a 6.25ms loop Detects in 500 ms	
Drive Motor Control Module A Lost Communication with Battery Energy Control Module on Bus B	U1847	*This diagnostic indicates a lost communication between the MCPA and the BECM on Bus B*						Two Trip, Type B
		DTC Fail case 1: Detects that CAN serial data communication has been lost with the Battery Energy Control Module on Bus B	Missed BECM Messages		Run/Crank Voltage PowerMode Normal Communication Enabled Normal Message Transmission Diagnostic Enable Timer	> 9.5 Volts =RUN =TRUE =TRUE >=3 sec	Executes in a 6.25ms loop Detects in 500 ms	
Drive Motor Control Module A Lost Communication with Hybrid Powertrain Control Module on Bus B	U1831	*This diagnostic indicates a lost communication between the MCPA and the HPCM on Bus B*						Two Trip, Type B
		DTC Fail case 1: Detects that CAN serial data communication has been lost with the HPCM on Bus B	Missed ECM Messages		Run/Crank Voltage	> 9.5 Volts	Executes in a 6.25ms loop Detects in 500 ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	Mil Illum
					PowerMode	=RUN		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Enable Timer	>=3 sec		
Drive Motor Control Module A Lost Communication with Hybrid Powertrain Control Module	U1845	*This diagnostic indicates a lost communication between the MCPA and the BCP*						Two Trip, Type B
		Detects that CAN serial data communication has been lost with the BCP	Missed BCP Messages		Run/Crank Voltage	> 9.5 Volts	Executes in a 6.25ms loop Detects in 500 ms	
					PowerMode	=RUN		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic Enable Timer	>=3 sec		

APPENDIX

ALU= Arithmetic Logic Unit

BPCM= Batt Pack Ctrl Module

HWIO= Hardware Input/Output

IGBT= Insulated Gate Bipolar Transistors (Phase Current Controllers)

OOR= Out of Range

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
High Voltage Battery:								
Hybrid Battery Voltage Sense A Circuit Low	P0B3D	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense B Circuit Low	P0B42	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense C Circuit Low	P0B47	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense D Circuit Low	P0B4C	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense E Circuit Low	P0B51	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense F Circuit Low	P0B56	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense G Circuit Low	P0B5B	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense H Circuit Low	P0B60	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense I Circuit Low	P0B65	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense J Circuit Low	P0B6A	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense K Circuit Low	P0B6F	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense L Circuit Low	P0B74	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense M Circuit Low	P0B79	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense N Circuit Low	P0B7E	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense O Circuit Low	P0B83	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA	> 8.8 V P1B36 Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAC	Not Running		
Hybrid Battery Voltage Sense P Circuit Low	P0B88	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense Q Circuit Low	P0B8D	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense R Circuit Low	P0B92	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA	> 8.8 V P1B37 Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAC	Not Running		
Hybrid Battery Voltage Sense S Circuit Low	P0B97	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense T Circuit Low	P0B9C	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense U Circuit Low	P0BA1	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA	> 8.8 V P1B38 Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAC	Not Running		
Hybrid Battery Voltage Sense V Circuit Low	P0BA6	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense W Circuit Low	P0BAB	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense X Circuit Low	P0BB0	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA	> 8.8 V P1B38 Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAC	Not Running		
Hybrid Battery Voltage Sense Y Circuit Low	P0BB5	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense Z Circuit Low	P0BBA	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AA Circuit Low	P1B17	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs:	> 8.8 V P1B39	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAA P1EAC	Not Running Not Running		
Hybrid Battery Voltage Sense AB Circuit Low	P1B1A	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AC Circuit Low	P1B1D	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AD Circuit Low	P1B20	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs:	> 8.8 V P1B39	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAA P1EAC	Not Running Not Running		
Hybrid Battery Voltage Sense AE Circuit Low	P1B23	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AF Circuit Low	P1B26	This DTC detects a circuit low voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	< 1.4 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense A Circuit High	P0B3E	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA	> 8.8 V P1B34 Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					P1EAC	Not Running		
Hybrid Battery Voltage Sense B Circuit High	P0B43	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense C Circuit High	P0B48	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense D Circuit High	P0B4D	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B34 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense E Circuit High	P0B52	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense F Circuit High	P0B57	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense G Circuit High	P0B5C	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense H Circuit High	P0B61	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense I Circuit High	P0B66	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense J Circuit High	P0B6B	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B35 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense K Circuit High	P0B70	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense L Circuit High	P0B75	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense M Circuit High	P0B7A	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense N Circuit High	P0B7F	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense O Circuit High	P0B84	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense P Circuit High	P0B89	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B36 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense Q Circuit High	P0B8E	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense R Circuit High	P0B93	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense S Circuit High	P0B98	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense T Circuit High	P0B9D	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B37 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense U Circuit High	P0BA2	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense V Circuit High	P0BA7	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense W Circuit High	P0BAC	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense X Circuit High	P0BB1	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense Y Circuit High	P0BB6	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense Z Circuit High	P0BBB	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B38 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AA Circuit High	P1B18	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AB Circuit High	P1B1B	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense AC Circuit High	P1B1E	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AD Circuit High	P1B21	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense AE Circuit High	P1B24	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Sense AF Circuit High	P1B27	This DTC detects a circuit high voltage condition in the Cell Voltage Sensor N Circuit	Cell Sense Line Measured Value	> 4.65 V	12V Battery Voltage No active DTCs: P1EAA P1EAC	> 8.8 V P1B39 Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense A Circuit	P0B3B	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value Delta Voltage change in 200 ms of Cell Sense Line N measured value	< 1.4 V > .5 V	No active DTC's 12V Battery Voltage P1EAA P1EAC	P1B34 > 8.8 V Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Voltage Sense B Circuit	P0B40	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B34	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense C Circuit	P0B45	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B34	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense D Circuit	P0B4A	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B34	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense E Circuit	P0B4F	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B35	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense F Circuit	P0B54	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B35	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense G Circuit	P0B59	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B35	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense H Circuit	P0B5E	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B35	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense I Circuit	P0B63	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B35	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense J Circuit	P0B68	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B35	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense K Circuit	P0B6D	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B36	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense L Circuit	P0B72	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B36	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense M Circuit	P0B77	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B36	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense N Circuit	P0B7C	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B36	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense O Circuit	P0B81	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B36	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense P Circuit	P0B86	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B36	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense Q Circuit	P0B8B	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value	< 1.4 V	No active DTC's	P1B37	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense R Circuit	P0B90	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B37	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense S Circuit	P0B95	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B37	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense T Circuit	P0B9A	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B37	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense U Circuit	P0B9F	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B38	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense V Circuit	P0BA4	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B38	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense W Circuit	P0BA9	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B38	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense X Circuit	P0BAE	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B38	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense Y Circuit	P0BB3	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B38	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense Z Circuit	P0BB8	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B38	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense AA Circuit	P1B28	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B39	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense AB Circuit	P1B29	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B39	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense AC Circuit	P1B2A	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B39	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense AD Circuit	P1B2B	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B39	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense AE Circuit	P1B2C	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B39	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	Frequency: 200ms	
Hybrid Battery Voltage Sense AF Circuit	P1B2D	This DTC detects a circuit open voltage condition in the Cell Voltage Sensor N Circuit by comparing the voltage of the adjacent cell and the rate of change of cell voltage	Cell Sense Line N Measured Value AND Cell Sense Line N-1 Measured value	< 1.4 V	No active DTC's	P1B39	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			Delta Voltage change in 200 ms of Cell Sense Line N measured value AND Cell Sense Line N-1 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense Low Reference A Circuit	P1B3D	This DTC detects a circuit open condition in the Hybrid Battery Voltage Sense Low Reference A Circuit	Cell Sense Line Measured Value	< 1.4 V	No active DTC's	P1B34 P1B35 P1B36 P1B37 P1B38 P1B39	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line 16 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		
Hybrid Battery Voltage Sense Low Reference B Circuit	P1B3E	This DTC detects a circuit open condition in the Hybrid Battery Voltage Sense Low Reference B Circuit	Cell Sense Line Measured Value	< 1.4 V	No active DTC's	P1B34 P1B35 P1B36 P1B37 P1B38 P1B39	7 Failures out of 10 Samples	Two Trips, Type B
			Delta Voltage change in 200 ms of Cell Sense Line 32 measured value	> .5 V	12V Battery Voltage	> 8.8 V	Frequency: 200ms	
					P1EAA	Not Running		
					P1EAC	Not Running		

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Temperature Sensor Circuit High	P0A9E	This DTC detects a circuit high voltage (low temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery 2 Temperature Sensor Circuit High Voltage	P0AC8	This DTC detects a circuit high voltage (low temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery 3 Temperature Sensor Circuit High Voltage	P0ACD	This DTC detects a circuit high voltage (low temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery 4 Temperature Sensor Circuit High Voltage	P0AEB	This DTC detects a circuit high voltage (low temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Temperature Sensor E Circuit High	P0BC5	This DTC detects a circuit high voltage (low temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Temperature Sensor F Circuit High	P0C36	This DTC detects a circuit high voltage (low temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Pack Air Temperature Sensor A Circuit High	P0AAF	This DTC detects a circuit high voltage (low temperature) condition in the Hybrid Battery Pack Air Temperature Sensor A Circuit High	Pack Air Temperature Sensor A Measured Value	> 4.63V (-45deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 250ms	Two Trips, Type B
Hybrid Battery Temperature Sensor Circuit Low	P0A9D	This DTC detects a circuit low voltage (high temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery 2 Temperature Sensor Circuit Low Voltage	P0AC7	This DTC detects a circuit low voltage (high temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery 3 Temperature Sensor Circuit Low Voltage	P0ACC	This DTC detects a circuit low voltage (high temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery 4 Temperature Sensor Circuit Low Voltage	P0AEA	This DTC detects a circuit low voltage (high temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Temperature Sensor E Circuit Low	P0BC4	This DTC detects a circuit low voltage (high temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Temperature Sensor F Circuit Low	P0C35	This DTC detects a circuit low voltage (high temperature) condition in the Cell Temperature Sensor N Circuit	Cell Temperature Sense Line Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
Hybrid Battery Pack Air Temperature Sensor A Circuit Low	P0AAE	This DTC detects a circuit low voltage (high temperature) condition in the Hybrid Battery Pack Air Temperature Sensor A Circuit High	Pack Air Temperature Sensor A Measured Value	< 0.3V (90deg C)	12V Battery Voltage P1A5D	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 250ms	Two Trips, Type B
Battery Energy Control Module 5 Volt Reference 2 Circuit	P1A5D	This diagnostic monitors the buffered 5V supply circuit 2	Battery Energy Control Module 5 Volt Reference 2 Circuit	X > 5.15V OR X < 4.85V	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 25ms	Two Trips, Type B
Hybrid Battery Pack Voltage Sense Circuit Low	P0ABC	Circuit Low monitor of Hybrid Battery Pack Voltage Sense Circuit	Hybrid Battery Pack Voltage Sense Measurement	< 30V	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 25ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Pack Voltage Sense Circuit High	P0ABD	Circuit High monitor of Hybrid Battery Pack Voltage Sense Circuit	Hybrid Battery Pack Voltage Sense Measurement	> 190.1V	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 25ms	Two Trips, Type B
Hybrid Battery Pack Current Sensor Circuit Low	P0AC1	Circuit Low monitor of Hybrid Battery Pack Current Sensor Circuit	Hybrid Battery Pack Current Sensor Circuit	< 0.2V (-230A)	12V Battery Voltage P1A07	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 25ms	Two Trips, Type B
Hybrid Battery Pack Current Sensor Circuit High	P0AC2	Circuit High monitor of Hybrid Battery Pack Current Sensor Circuit	Hybrid Battery Pack Current Sensor Circuit	> 4.65V (215A)	12V Battery Voltage P1A07	> 8.8 V Not Fault Active	7 Failures out of 10 Samples Frequency: 25ms	Two Trips, Type B
Hybrid/EV Battery Pack Current Sensor A Exceeded Learning Limit	P1EBA	Detects that the Current Sensor A Offset check is not out of range	Hybrid/EV Battery Pack Current Sensor	X < 2.57V (+7Amps) OR X > 2.43V (-7Amps)	12V Battery Voltage P1A07 Contactor Status	> 8.8 V Not Fault Active = Open	4 Failures out of 6 Samples Frequency: 10us	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Battery Energy Control Module 5 Volt Reference Circuit	P1A07	This diagnostic monitors the buffered 5V supply circuit	Battery Energy Control Module 5 Volt Reference Circuit	X < 5.15V OR X > 4.85V	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 250ms	Two Trips, Type B
Battery Energy Control Module Ignition Switch Run/Start Position Circuit Low	P1A5E	This monitor rationalizes the Run/Start Position line from the ECM master as Stuck Low	Hardwire Run/Crank AND Engine Controller Run Crank Terminal Status	= Low = High	12V Battery Voltage Comm signal from ECM with Engine Controller Run Crank Terminal Status U180B	> 8.8 V =High Not Faut Active	350 Failures out of 400 Samples Frequency: 25ms	Two Trips, Type B
Battery Energy Control Module Ignition Switch Run/Start Position Circuit High	P1A5F	This monitor rationalizes the Run/Start Position line from the ECM master as Stuck High	Hardwire Run/Crank AND Engine Controller Run Crank Terminal Status	= High = Low	12V Battery Voltage Comm signal from ECM with Engine Controller Run Crank Terminal Status U180B	> 8.8 V =High Not Faut Active	350 Failures out of 400 Samples Frequency: 25ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Battery Energy Control Module Communication Bus A Off	U180B	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state on BUS A	CAN device driver for Bus A	= bus-off state.	12V Battery Voltage	> 8.8 V	4 Failures out of 5 Samples Frequency: 500ms	Two Trips, Type B
Battery Energy Control Module Communication Bus B Off	U1811	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state on BUS B	CAN device driver for Bus B	= bus-off state.	12V Battery Voltage	> 8.8 V	4 Failures out of 5 Samples Frequency: 500ms	Two Trips, Type B
Battery Energy Control Module Lost Communication with Hybrid Powertrain Control Module on Bus B	U1844	Detects that CAN serial data communication has been lost with the Hybrid Powertrain Control Module on Bus B	Missed Hybrid Powertrain Control Module Messages		12V Battery Voltage U1811	> 8.8 V Not Fault Active	400 Failures out of 480 Samples Frequency: 25ms	Two Trips, Type B
Battery Energy Control Module Lost Communication With Hybrid Powertrain Control Module	U1885	Detects that CAN serial data communication has been lost with the Hybrid Powertrain Control Module on Bus A	Missed Hybrid Powertrain Control Module Messages		12V Battery Voltage U180B	> 8.8 V Not Fault Active	400 Failures out of 480 Samples Frequency: 25ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Battery Energy Control Module Lost Communication With Engine Control Module (ECM)	U1886	Detects that CAN serial data communication has been lost with the Engine Control Module (ECM) on Bus A	Missed Engine Control Module (ECM) Messages		12V Battery Voltage U180B	> 8.8 V Not Fault Active	400 Failures out of 480 Samples Frequency: 25ms	Two Trips, Type B
Battery Energy Control Module Main Processor Performance	P1A5C	DTC Fail case 1: Indicates that the BECM has detected an internal processor integrity fault Stack Overflow / Underflow	Microcontroller detects Stack Overflow / underflow		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: 25ms	One Trip, Type A
		OR						
		DTC Fail case 2: Indicates that the BECM has detected an internal processor integrity fault External Clock Failure	Microcontroller detects External Clock Failure		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: 25ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		OR						
		DTC Fail case 3: Indicates that the BECM has detected an internal processor integrity fault Address Error	Microcontroller detects an illegal address request		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: 25ms	
		OR						
		DTC Fail case 4: Indicates that the BECM has detected an internal processor integrity fault Illegal Instruction	Microntroller detects an illegal instruction		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: 25ms	
		OR						
		DTC Fail case 5: Indicates that the BECM has detected an internal processor integrity fault	Microntroller detects an illegal interruption		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		Illegal Interruption						
		OR						
		DTC Fail case 6: Indicates that the BECM has detected an internal processor integrity fault Watchdog Timer Fault	Microntroller detects an Watchdog Timer Fault		12V Battery Voltage	> 8.8 V	3 Failures out of 5 Samples Frequency: Wake up	
		OR						
		DTC Fail case 7: Indicates that the BECM has detected an internal processor integrity fault Temperature Multiplexer Input(open or short)	Microcontroller detects an open between the Integrated Circuit that reads temperature and the main Microcontroller		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Battery Energy Control Module Random Access Memory (RAM)	P1A05	Indicates that Battery Energy Control Module is unable to correctly write to Write Protect RAM	Battery Energy Control Module is able to read the verify the test passed		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: Wake Up AND Power off	One Trip, Type A
Battery Energy Control Module Read Only Memory (ROM)	P1A06	Indicates that Battery Energy Control Module detects if any check sum in the calibration is incorrect	Calculated Checksum does not match stored checksum		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: Wake Up AND Power off	One Trip, Type A
Battery Energy Control Module Long Term Memory Performance	P1A01	DTC Fail case 1: Non-volatile memory checksum (Group A) error at controller power-down	Group A: All Data Sets Uncommon		12V Battery Voltage	> 8.8 V	3 Failures out of 5 Samples Frequency: Key Off	One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		OR						
		DTC Fail case 2: Non-volatile memory checksum (Group B) error at controller power-down	Group B: Checksum Error in 2 Areas		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: Key Off	
		OR						
		DTC Fail case 3: Non-volatile memory checksum (Group C) error at controller power-down	Group C: Checksum Error		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples Frequency: Key Off	
		OR						
		DTC Fail case 4: Non-volatile memory checksum (Group D) error at controller comm off	Group D: Checksum Error		12V Battery Voltage	> 8.8 V	1 Failures out of 1 Samples	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							Frequency: Comm Off	
Battery Energy Control Module Hybrid Battery Voltage Balance Circuit	P1B33	DTC Fail case 1: Battery Energy Control Module detects a failure in the Voltage Balance Circuit	Balancing Switch Status is	not equal to Balancing Switch Command	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
		OR						
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Circuit	balancing Switch Fault Flag	= TRUE	12V Battery Voltage P1EAA P1EAC	> 8.8 V Not Running Not Running	7 Failures out of 10 Samples Frequency: 200ms	
Hybrid Battery Voltage Balance Processor A Performance	P1B34	DTC Fail case 1: Battery Energy Control Module detects a loss of internal communcation with Balance Processor A	No Lin Communication from LIBB A		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
		OR						

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Processor Circuit	LIBB A System MF Flag	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 3: Battery Energy Control Module detects Error in the internal communication with Balance Processor checksum at power off	LIN Bus Check error at the previous ignition key		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 4: Battery Energy Control Module detects a failure in the Voltage Balance Circuit for Balance Processor A	The balancing switch failure detected in P1B33 exists in LIBB 1	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Hybrid Battery Voltage Balance Processor B Performance	P1B35	DTC Fail case 1: Battery Energy Control Module detects a loss of internal communcation with Balance Processor B	No Lin Communication from LIBB B		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
		OR						
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Processor Circuit	LIBB B System MF Flag	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 3: Battery Energy Control Module detects Error in the internal communication with Balance Processor checksum at power off	LIN Bus Check error at the previous ignition key		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		OR						
		DTC Fail case 4: Battery Energy Control Module detects a failure in the Voltage Balance Circuit for Balance Processor B	The balancing switch failure detected in P1B33 exists in LIBB 2	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
Hybrid Battery Voltage Balance Processor C Performance	P1B36	DTC Fail case 1: Battery Energy Control Module detects a loss of internal communcation with Balance Processor C	No Lin Communication from LIBB C		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
		OR						
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Processor Circuit	LIBB C System MF Flag	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		OR						
		DTC Fail case 3: Battery Energy Control Module detects Error in the internal communication with Balance Processor checksum at power off	LIN Bus Check error at the previous ignition key		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 4: Battery Energy Control Module detects a failure in the Voltage Balance Circuit for Balance Processor C	The balancing switch failure detected in P1B33 exists in LIBB 3	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
Hybrid Battery Voltage Balance Processor D Performance	P1B37	DTC Fail case 1: Battery Energy Control Module detects a loss of internal communcation with Balance Processor D	No Lin Communication from LIBB D		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							Frequency: 200ms	
		OR						
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Processor Circuit	LIBB D System MF Flag	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 3: Battery Energy Control Module detects Error in the internal communication with Balance Processor checksum at power off	LIN Bus Check error at the previous ignition key		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 4: Battery Energy Control Module detects a failure in the Voltage Balance Circuit for Balance Processor D	The balancing switch failure detected in P1B33 exists in LIBB 4	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							Frequency: 200ms	
Hybrid Battery Voltage Balance Processor E Performance	P1B38	DTC Fail case 1: Battery Energy Control Module detects a loss of internal communcation with Balance Processor E	No Lin Communication from LIBB E		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
		OR						
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Processor Circuit	LIBB E System MF Flag	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 3: Battery Energy Control Module detects Error in the internal communication with Balance Processor checksum at power off	LIN Bus Check error at the previous ignition key		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							Frequency: 200ms	
		OR						
		DTC Fail case 4: Battery Energy Control Module detects a failure in the Voltage Balance Circuit for Balance Processor E	The balancing switch failure detected in P1B33 exists in LIBB 5	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
Hybrid Battery Voltage Balance Processor F Performance	P1B39	DTC Fail case 1: Battery Energy Control Module detects a loss of internal communcation with Balance Processor F	No Lin Communication from LIBB F		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	Two Trips, Type B
		OR						
		DTC Fail case 2: Battery Energy Control Module detects a failure in the Voltage Balance Processor Circuit	LIBB F System MF Flag	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples	

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							Frequency: 200ms	
		OR						
		DTC Fail case 3: Battery Energy Control Module detects Error in the internal communication with Balance Processor checksum at power off	LIN Bus Check error at the previous ignition key		12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	
		OR						
		DTC Fail case 4: Battery Energy Control Module detects a failure in the Voltage Balance Circuit for Balance Processor F	The balancing switch failure detected in P1B33 exists in LIBB 6	= True	12V Battery Voltage	> 8.8 V	7 Failures out of 10 Samples Frequency: 200ms	

13 OBDG05C Hybrid Diagnostics

Cert Doc Bundle Name																		
Cell Voltage Rationality FA	P0B3D	P0B42	P0B47	P0B4C	P0B51	P0B56	P0B5B	P0B60	P0B65	P0B6A	P0B6F	P0B74	P0B79	P0B7E	P0B83	P0B88	P0B8D	P0B92
	P0B97	P0B9C	P0BA1	P0BA6	P0BAB	P0BB0	P0BB5	P0BBA	P1B17	P1B1A	P1B1D	P1B20	P1B23	P1B26	P0B3E	P0B43	P0B48	P0B4D
	P0B52	P0B57	P0B5C	P0B61	P0B66	P0B6B	P0B70	P0B75	P0B7A	P0B7F	P0B84	P0B89	P0B8E	P0B93	P0B98	P0B9D	P0BA2	P0BA7
	P0BAC	P0BB1	P0BB6	P0BBB	P1B18	P1B1B	P1B1E	P1B21	P1B24	P1B27	P0B3B	P0B40	P0B45	P0B4A	P0B4F	P0B54	P0B59	P0B5E
	P0B63	P0B68	P0B6D	P0B72	P0B77	P0B7C	P0B81	P0B86	P0B8B	P0B90	P0B95	P0B9A	P0B9F	P0BA4	P0BA9	P0BAE	P0BB3	P0BB8
	P1B28	P1B29	P1B2A	P1B2B	P1B2C	P1B2D	P0B3C	P0B41	P0B46	P0B4B	P0B50	P0B55	P0B5A	P0B5F	P0B64	P0B69	P0B6E	P0B73
	P0B78	P0B7D	P0B82	P0B87	P0B8C	P0B91	P0B96	P0B9B	P0BA0	P0BA5	P0BAA	P0BAF	P0BB4	P0BB9	P1B16	P1B19	P1B1C	P1B1F
	P1B22	P1B25	U182A															
Cell Voltage Circuit FA	P0B3D	P0B42	P0B47	P0B4C	P0B51	P0B56	P0B5B	P0B60	P0B65	P0B6A	P0B6F	P0B74	P0B79	P0B7E	P0B83	P0B88	P0B8D	P0B92
	P0B97	P0B9C	P0BA1	P0BA6	P0BAB	P0BB0	P0BB5	P0BBA	P1B17	P1B1A	P1B1D	P1B20	P1B23	P1B26	P0B3E	P0B43	P0B48	P0B4D
	P0B52	P0B57	P0B5C	P0B61	P0B66	P0B6B	P0B70	P0B75	P0B7A	P0B7F	P0B84	P0B89	P0B8E	P0B93	P0B98	P0B9D	P0BA2	P0BA7
	P0BAC	P0BB1	P0BB6	P0BBB	P1B18	P1B1B	P1B1E	P1B21	P1B24	P1B27	P0B3B	P0B40	P0B45	P0B4A	P0B4F	P0B54	P0B59	P0B5E
	P0B63	P0B68	P0B6D	P0B72	P0B77	P0B7C	P0B81	P0B86	P0B8B	P0B90	P0B95	P0B9A	P0B9F	P0BA4	P0BA9	P0BAE	P0BB3	P0BB8
	P1B28	P1B29	P1B2A	P1B2B	P1B2C	P1B2D	U182A											
Temp Rationality FA	P0A9C	P0AC6	P0ACB	P0AE9	P0BC3	P0C34	P0A9D	P0AC7	P0ACC	P0AEA	P0BC4	P0C35	P0A9E	P0AC8	P0ACD	P0AEB	P0BC5	P0C36
	P1A5D	P0B45	P0B46	P0B47	P0B48	P0B4F	P0B50	P0B51	P0B52	P0B63	P0B64	P0B65	P0B66	P0B95	P0B96	P0B97	P0B98	P0B9F
	P0BA0	P0BA1	P0BA2															
Temp Circuit FA	P0A9D	P0AC7	P0ACC	P0AEA	P0BC4	P0C35	P0A9E	P0AC8	P0ACD	P0AEB	P0BC5	P0C36	P1A5D	P0B45	P0B46	P0B47	P0B48	P0B4F
BCP Voltage FA	P0ABC	P0ABD	P0B3D	P0B42	P0B47	P0B4C	P0B51	P0B56	P0B5B	P0B60	P0B65	P0B6A	P0B6F	P0B74	P0B79	P0B7E	P0B83	P0B88
	P0B8D	P0B92	P0B97	P0B9C	P0BA1	P0BA6	P0BAB	P0BB0	P0BB5	P0BBA	P1B17	P1B1A	P1B1D	P1B20	P1B23	P1B26	P0B3E	P0B43
	P0B48	P0B4D	P0B52	P0B57	P0B5C	P0B61	P0B66	P0B6B	P0B70	P0B75	P0B7A	P0B7F	P0B84	P0B89	P0B8E	P0B93	P0B98	P0B9D
	P0BA2	P0BA7	P0BAC	P0BB1	P0BB6	P0BBB	P1B18	P1B1B	P1B1E	P1B21	P1B24	P1B27	P0B3B	P0B40	P0B45	P0B4A	P0B4F	P0B54
	P0B59	P0B5E	P0B63	P0B68	P0B6D	P0B72	P0B77	P0B7C	P0B81	P0B86	P0B8B	P0B90	P0B95	P0B9A	P0B9F	P0BA4	P0BA9	P0BAE
	P0BB3	P0BB8	P1B28	P1B29	P1B2A	P1B2B	P1B2C	P1B2D	P0B3C	P0B41	P0B46	P0B4B	P0B50	P0B55	P0B5A	P0B5F	P0B64	P0B69
	P0B6E	P0B73	P0B78	P0B7D	P0B82	P0B87	P0B8C	P0B91	P0B96	P0B9B	P0BA0	P0BA5	P0BAA	P0BAF	P0BB4	P0BB9	P1B16	P1B19
	P1B1C	P1B1F	P1B22	P1B25	U182A													

Low Parasitic Mode	True	When *Propulsion Active* is **True** and *Contactors Status* is **Open** (for any fault reason) and a timer of **2.5 sec** has expired.

Cell Under Voltage Thresh	Temperature (°C)	-30	-20	-10	0	10	20	30	40	50
	Voltage (V)	1.93	1.93	1.93	1.93	1.94	1.94	1.94	1.94	1.94
Pack Under Voltage Thresh	Temperature (°C)	-30	-20	-10	0	10	20	30	40	50
	Voltage (V)	61.91	61.91	61.91	61.91	61.91	61.91	61.91	61.91	61.91
Cell Over Voltage Thresh	Temperature (°C)	-30	-20	-10	0	10	20	30	40	50
	Voltage (V)	4.27	4.27	4.27	4.26	4.26	4.26	4.26	4.26	4.26
Pack Over Voltage Thresh	Temperature (°C)	-30	-20	-10	0	10	20	30	40	50
	Voltage (V)	136.49	136.49	136.49	136.49	136.49	136.49	136.49	136.49	136.49

End of Life ResistanceThresh	Temperature(°C) / SOC (%)	10	20	30	40	50	60	70	80	90
	-30	5.704	5.704	5.676	4.380	3.842	3.554	3.382	3.295	3.266
	-20	4.351	3.808	3.670	2.950	2.599	2.398	2.302	2.258	2.210
	-10	2.998	1.913	1.663	1.519	1.356	1.241	1.222	1.222	1.154
	0	1.490	1.116	0.991	0.903	0.822	0.766	0.742	0.729	0.701
	10	0.858	0.692	0.624	0.575	0.532	0.502	0.484	0.474	0.462
	20	0.678	0.563	0.511	0.473	0.441	0.417	0.403	0.394	0.386
	30	0.449	0.397	0.365	0.341	0.322	0.307	0.297	0.290	0.286
	40	0.400	0.360	0.333	0.312	0.294	0.282	0.273	0.266	0.262
	50	0.360	0.327	0.300	0.280	0.264	0.255	0.246	0.240	0.235

Expect Sequence		3	5	13	11					
	or	0	6	14	8					