

08 GRP08a BAS Hybrid ESCM

Component/Sys tem	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Req'd	MIL Illum
Battery System Performance Diagnostics								
Replace Hybrid Battery Pack	P0A80	This DTC indicates the Battery Pack resistance has increased such that it affects the hybrid vehicle performance.	Pack_Resistance	> Resistance_ Criteria Where Resistance_ Criteria = TempFactorLow + SOCFactorLow TempFactorLow kup(T) = -40 .18 -30 .18 -20 .18 -10 .18 0 .18 10 .18 20 .055 30 .055 40 .055 50 .055 60 .055 70 .055 80 .055 90 .055 100 .055 110 .055 120 .055 Where SOCFactorLow kup(SOC)= 0 .007 10 .007	Battery Voltage Battery Current Battery Temp Battery State of Charge Battery Resistance Low Battery Resistance Severe Low Battery Resistance Calc. Regression No active DTCs Battery Temp Battery State of Charge	valid valid valid valid valid valid valid P0AC0 P0AC1 P0AC2 P1A48 P1A49 P1A22 P1A23 P1A29 P1A2A P1A30 P1A31 NOT < -7 C NOT > 90%	1100 test failures in a 1150 test samples 1 sample / 500 ms	Two Trips

08 GRP08a BAS Hybrid ESCM

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				20 .004 30 .003 40 .001 50 0 60 0 70 0 80 .0015 90 .003 100 .003				
SOH - Delta V - Voltage Deviation High	P1A59	Checks the deviation of the voltage across the battery pack using the 3 module voltage sensors. If one module or electrical connection within the pack is bad, it will manifest itself in a high Delta - V	<p>MAX(ModuleVolt1, ModuleVolt2, ModuleVolt3) - MIN (ModuleVolt1, ModuleVolt2, ModuleVolt3)</p> <p><-----OR-----></p> <p>MAXcorrected (ModuleVolt1, ModuleVolt2, ModuleVolt3) - MINcorrected (ModuleVolt1, ModuleVolt2, ModuleVolt3)</p> <p>Where CorrectedModVolt = PackVoltage - Module VoltageX1 - ModuleVoltage X2 Where X1 and X2 are the VALID signal readings</p>	> 0.6 Volts	<p>Module Voltage 1 Module Voltage 2 Module Voltage 3</p> <p>any 1 module volta - AND - Pack Voltage</p>	<p>VALID VALID VALID</p> <p>INVALID VALID</p>	60 test failures in 100 test samples Frequency: 1 sample/100ms	Two Trips
Hybrid Battery Temperature Delta T	P1A5A	Detects a Deviation Between The Battery	Absolute value of the difference between any temperature sensor and the	> 4 C	All Temp Sensors	VALID	80 Fails 100 Samples 1 sample in	Two Trips

08 GRP08a BAS Hybrid ESCM

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		Temperature Sensors in the Battery Pack	average of all temperature sensors				100 ms	
Battery Pack Over Current	P1AB0	Battery Pack Over Current. May have Cleared Fuse.	Battery Pack Current OR Battery Pack Current	> 140 < -330	Battery Pack Curr Current Sensor Out of Range Diagnostics and Performance (P0AC0, P0AC1, P0AC2, P1A48, P1A49)	VALID NOT FAIL	40 test failures in a 42 test samples Frequency: 1 sample/50 ms	One Trip
ECM Hybrid Battery Pack Over Temperature	P0A7E	Detects if the battery pack is over temperature	MAX of any Module Temperature	> 57 Deg. C	BatteryModule Temperature1a BatteryModule Temperature1b BatteryModule Temperature2a BatteryModule Temperature2b BatteryModule Temperature3a BatteryModule Temperature3b	valid valid valid valid valid	1000 test failures in a 1100 test samples 1 sample / 100 ms	Two Trips
Temperature Sensor Circuits								
Temperature Sensor 1A Circuit Low	P0A9D	This DTC indicates that Temperature Sensor 1A is low.	Temperature Sensor 1A Raw A/D	< 0.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips

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Temperature Sensor 1A Circuit High	P0A9E	This DTC indicates that Temperature Sensor 1A is high.	Temperature Sensor 1A Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 1B Circuit Low	P0AC7	This DTC indicates that Temperature Sensor 1B is low.	Temperature Sensor 1B Raw A/D	< 0.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 1B Circuit High	P0AC8	This DTC indicates that Temperature Sensor 1B is high.	Temperature Sensor 1B Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 2A Circuit Low	P0ACC	This DTC indicates that Temperature Sensor 2A is low.	Temperature Sensor 2A Raw A/D	< 0.5 Volts	System Power Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 2A Circuit High	P0ACD	This DTC indicates that Temperature Sensor 2A is high.	Temperature Sensor 2A Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 2B Circuit Low	P0AEA	This DTC indicates that Temperature Sensor 2B is low.	Temperature Sensor 2B Raw A/D	< 0.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 2B Circuit High	P0AEB	This DTC indicates that Temperature Sensor 2B is high.	Temperature Sensor 2B Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature	P1A1A	This DTC indicates	Temperature Sensor 3A	< 0.5 Volts	Sys Pwr Mode	RUN or	188 test failures	Two

08 GRP08a BAS Hybrid ESCM

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Sensor 3A Circuit Low		that Temperature Sensor 3A is low.	Raw A/D		Buffered +5V DTC	SERVICE != FAIL	in 250 test samples Frequency: 1 sample/20ms	Trips
Temperature Sensor 3A Circuit High	P1A1B	This DTC indicates that Temperature Sensor 3A is high.	Temperature Sensor 3A Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 3B Circuit Low	P1A1D	This DTC indicates that Temperature Sensor 3B is low.	Temperature Sensor 3B Raw A/D	< 0.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 3B Circuit High	P1A1E	This DTC indicates that Temperature Sensor 3B is high.	Temperature Sensor 3B Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Temperature Sensor 1a Ckt Performance	P0A9C	Rationality Check for the Temperature Sensor 1a Located at the ESCM	ModuleTemp1a - ModuleTempsAvg	> BattRatThresh Where BattRatThresh = (in: Tpack, out: temp thresh)= [-40 8 -30 8 -20 8 -10 8 0 8 10 8 20 8 30 8 40 8 50 8 60 8]	BatteryModule Temperature1a	valid	30 test failures in a 40 test samples 1 sample / 100 ms	Two Trips

08 GRP08a BAS Hybrid ESCM

Component/System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Req'd	MIL Illum
Temperature Sensor 1b Ckt Performance	P0AC6	Rationality Check for the Temperature Sensor 1b Located at the ESCM	ModuleTemp1b - ModuleTempsAvg	BattRatThresh Where BattRatThresh = (in: Tpack, out: temp thresh)= [-40 8 -30 8 -20 8 -10 8 0 8 10 8 20 8 30 8 40 8 50 8 60 8]	BatteryModule Temperature1b	valid	30 test failures in a 40 test samples 1 sample / 100 ms	Two Trips
Temperature Sensor 2a Ckt Performance	P0ACB	Rationality Check for the Temperature Sensor 2a Located at the ESCM	ModuleTemp2a - ModuleTempsAvg	> BattRatThresh Where BattRatThresh = (in: Tpack, out: temp thresh)= [-40 8 -30 8 -20 8 -10 8 0 8 10 8 20 8 30 8 40 8 50 8 60 8]	BatteryModule Temperature2a	valid	30 test failures in a 40 test samples 1 sample / 100 ms	Two Trips

08 GRP08a BAS Hybrid ESCM

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Temperature Sensor 2b Ckt Performance	P0AE9	Rationality Check for the Temperature Sensor 2b Located at the ESCM	ModuleTemp2b - ModuleTempsAvg	> BattRatThresh Where BattRatThresh = (in: Tpack, out: temp thresh)= [-40 8 -30 8 -20 8 -10 8 0 8 10 8 20 8 30 8 40 8 50 8 60 8]	BatteryModule Temperature2b	valid	30 test failures in a 40 test samples 1 sample / 100 ms	Two Trips
Temperature Sensor 3a Ckt Performance	P0BC3	Rationality Check for the Temperature Sensor 3a Located at the ESCM	ModuleTemp3a - ModuleTempsAvg	> BattRatThresh Where BattRatThresh = (in: Tpack, out: temp thresh)= [-40 8 -30 8 -20 8 -10 8 0 8 10 8 20 8 30 8 40 8 50 8 60 8]	BatteryModule Temperature3a	valid	30 test failures in a 40 test samples 1 sample / 100 ms	Two Trips

08 GRP08a BAS Hybrid ESCM

Component/Sys tem	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Req'd	MIL Illum
Temperature Sensor 3b Ckt Performance	P1A1C	Rationality Check for the Temperature Sensor 3b Located at the ESCM	ModuleTemp3b - ModuleTempsAvg	> BattRatThresh Where BattRatThresh = (in: Tpack, out: temp thresh)= [-40 8 -30 8 -20 8 -10 8 0 8 10 8 20 8 30 8 40 8 50 8 60 8]	BatteryModule Temperature3b	valid	30 test failures in a 40 test samples 1 sample / 100 ms	Two Trips
Voltage Sensor Circuits								
Pack Voltage Sensor Circuit Performance	P0ABB	Rationality Check for the Voltage Sensor Located at The Battery Pack (ESCM)	BatteryPackVoltage-PackRatMean_Volt (PackRatMean_Volt = (PowerElectronicsVolt + ModVolt1 + ModVolt2 + ModVolt3)/ 2.)	> 5	Battery Pack Voltage Validity Startup Timer Battery Current Validity Battery Current Battery Current	valid > 6 Sec valid > -5 Amps < 5 Amps	9 test failures in a 10 test samples 1 sample / 100 ms	Two Trips
Voltage Sensor 1 Circuit Performance	P1A25	Rationality Check for the Module Voltage Sensor 1 located at the The Battery Pack (ESCM)	ModuleVoltage1 - ModuleVoltsAvg where ModuleVoltsAvg = [MIDDLE(ModVolt1, ModVolt2, ModVolt3) +	> 6 Volts	Pack Voltage Startup Timer Battery Current	VALID > 6 seconds VALID > -5 A < 5 A	Frequency: 1 sample/100ms	Two Trips

08 GRP08a BAS Hybrid ESCM

Component/Sys tem	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Req'd	MIL Illum
			PackVoltage/3 + PowerElectronicsVolt/3] /3					
Voltage Sensor 2 Circuit Performance	P1A2C	Rationality Check for the Module Voltage Sensor 2 located at the The Battery Pack (ESCM)	ModuleVoltage2 - ModuleVoltsAvg where ModuleVoltsAvg = [MIDDLE(ModVolt1, ModVolt2, ModVolt3) + PackVoltage/3 + PowerElectronicsVolt/3] /3	> 6 Volts	Pack Voltage Startup Timer Battery Current	VALID > 6 seconds VALID > -5 A < 5 A	Frequency: 1 sample/100ms	Two Trips
Voltage Sensor 3 Circuit Performance	P1A33	Rationality Check for the Module Voltage Sensor 3 located at the The Battery Pack (ESCM)	ModuleVoltage3 - ModuleVoltsAvg where ModuleVoltsAvg = [MIDDLE(ModVolt1, ModVolt2, ModVolt3) + PackVoltage/3 + PowerElectronicsVolt/3] /3	> 6 Volts	Pack Voltage Startup Timer Battery Current	VALID > 6 seconds VALID > -5 A < 5 A	Frequency: 1 sample/100ms	Two Trips
Pack Voltage Low	P0ABC	This DTC indicates that the Pack Voltage is low.	Pack Voltage Raw A/D	< 0.5 Volts	Sys Pwr Mode	RUN or SERVICE or POWERDOWN	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Pack Voltage High	P0ABD	This DTC indicates that the Pack Voltage is high.	Pack Voltage Raw A/D	> 4.85 Volts	Sys Pwr Mode	RUN or SERVICE or POWERDOWN	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Link Voltage Low	P1A0E	This DTC indicates that the Link Voltage	Link Voltage Raw A/D	< 0.5 Volts	Sys Pwr Mode	RUN or SERVICE or	188 test failures in 250 test	Two Trips

08 GRP08a BAS Hybrid ESCM

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		is low.			Contactora State Contactora Status	POWERDOWN CLOSED != OPEN_ SERVICE_ DISCONNEC	samples Frequency: 1 sample/20ms	
Link Voltage High	P1A0F	This DTC indicates that the Link Voltage is high.	Link Voltage Raw A/D	> 4.85 Volts	Sys Pwr Mode Contactora State Contactora Status	RUN or SERVICE or POWERDOWN CLOSED != OPEN_ SERVICE_ DISCONNEC	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Link Voltage Performance	P1A47	This DTC indicates the Link Voltage Performance.	Link Voltage - Σ (All Module Voltages)	> 5 Volts	Sys Pwr Mode Contactora State All module voltage DTCs Link Voltage DTCs All module voltages Link Voltage	RUN or SERVICE or POWERDOWN CLOSED PASSED PASSED VALID VALID	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery 1 Circuit Low Voltage	P1A22	This DTC indicates that Module 1 Voltage is low.	Module 1 Voltage Raw A/D	< 0.25 Volts	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery 1 Circuit High Voltage	P1A23	This DTC indicates that Module 1 Voltage is high.	Module 1 Voltage Raw A/D	> 4.85 Volts	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery 2 Circuit Low Voltage	P1A29	This DTC indicates that Module 2 Voltage is low.	Module 2 Voltage Raw A/D	< 0.25 Volts	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1	Two Trips

08 GRP08a BAS Hybrid ESCM

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							sample/20ms	
Hybrid Battery 2 Circuit High Voltage	P1A2A	This DTC indicates that Module 2 Voltage is high.	Module 2 Voltage Raw A/D	> 4.85 Volts	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery 3 Circuit Low Voltage	P0B47	This DTC indicates that Module 3 Voltage is low.	Module 3 Voltage Raw A/D	< 0.25 Volts	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery 3 Circuit High Voltage	P1A31	This DTC indicates that Module 3 Voltage is high.	Module 3 Voltage Raw A/D	> 4.85 Volts	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery 1 Voltage Low	P1A26	Detects a Low Battery Pack Voltage causing Disabled Hybrid	Battery Pack Voltage	< 22 Volts			50ms	Two Trips
Fan								
Fan Control Low	P0A84	This DTC indicates that the Fan speed is low.	Fan Control Feedback	< 5%	Sys Pwr Mode Fan State System 12V	RUN or SERVICE ON > 11 Volts < 18 Volts	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Fan Control High	P0A85	This DTC indicates that the fan control speed is high.	Fan Control Feedback	> 95%	Sys Pwr Mode Fan State Fan Command System 12V	RUN or SERVICE ON < 80% > 11 Volts < 18 Volts	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Fan Stuck Off	P0A82	This DTC indicates that the Fan is stuck off.	Fan Speed Feedback	< 5%	Sys Pwr Mode Fan State System 12V	RUN or SERVICE ON > 11 Volts	188 test failures in 250 test samples Frequency: 1	Two Trips

08 GRP08a BAS Hybrid ESCM

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						< 18 Volts	sample/20ms	
Fan Stuck On	P0A83	This DTC indicates that the Fan is stuck on.	Fan Speed Feedback	> 5%	Sys Pwr Mode	RUN or SERVICE	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Controller								
Controller Stack Over Run	P1A08	This DTC indicates that the Controller has encountered a stack over run.	# of Over Runs	> 0	Sys Pwr Mode	Run or Service or Powerdown or Powerup or Failure Loop	1 test failure in 1 test sample Frequency: 1 sample/20ms	Two Trips
Controller RAM error	P1A05	This DTC indicates that the Controller has encountered a RAM error.	Error during write to a location in RAM.		Sys Pwr Mode	Run or Service or Powerdown or Powerup or Failure Loop	1 test failure in 1 test sample Frequency: 1 sample/20ms	One Trip
Controller ROM error	P1A06	This DTC indicates that the Controller has encountered a ROM error.	Checksum does not match.		Sys Pwr Mode	Run or Service or Powerdown or Powerup or Failure Loop	1 test failure in 1 test sample Frequency: 1 sample/20ms	Two Trips
Controller EEPROM error	P1A04	This DTC indicates that the Controller has encountered an EEPROM error.	Checksum does not match.		Sys Pwr Mode	Powerup	1 test failure in 1 test sample Frequency: 1 sample/100ms	Two Trips
Buffered +5 volts out of range	P1A07	This DTC ensures that the buffered +5 volts used by the electronics has not fallen below a good value.	Buffered 5V	< 4.7 Volts	Sys Pwr Mode System 12V	RUN or SERVICE or POWERUP > 11 Volts	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Contactors								

08 GRP08a BAS Hybrid ESCM

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Contactor Shorted Low	P0ADB	This DTC indicates that the Contactor is shorted low.	Contactor Control Feedback	> 98%	Sys Pwr Mode Contactor State Contactor Status	RUN or SERVICE or POWERDOWN CLOSED != OPEN_SERVICE_DISCONNECT	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Contactor Shorted High	P0ADC	This DTC indicates that the Contactor is shorted high.	Contactor Control Feedback	< 5%	Sys Pwr Mode Contactor State Contactor Status	RUN or SERVICE or POWERDOWN CLOSED != OPEN_SERVICE_DISCONNECT	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Contactor Stuck Closed	P0AA1	This DTC indicates that the Contactor is stuck closed.	Link Voltage before contactors open + 50mV	> Link voltage when contactors are	Sys Pwr Mode Pack Current Contactor State Contactor Status Current Sensor DTCs Pack Voltage Reading Pack Voltage DTCs	OFF < -0.3 Amps (must be seen within 250 ms of commanding contactors open) OPEN != OPEN_SERVICE_DISCONNECT PASSED VALID PASSED	20 test failures in 20 test samples Frequency: 1 sample/20ms	Two Trips
Hybrid Battery Contactor Stuck Open	P0AA2	Detects that the Battery Pack has not closed contactor after commanding contactor closed	ECM Contactor Commanded Close Time since Commanded Close Contactor Status Contactor Status	Close >= 3 Sec NOT Defaulted NOT Closed	Time Since Key Off OR Controlled Disconnect Contactor Hybrid Default 1	< 3 Sec FALSE FALSE	1 test failure in 1 test sample	Two Trips

08 GRP08a BAS Hybrid ESCM

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		OR Detects that the Open service Disconnect is active	Contactors Status Contactors Status	NOT Defaulted Open Serv Disconnect				
Current Sensor Circuits								
Current Sensor 1 (-30 to 30 A) Low	P0AC1	This DTC indicates that Current Sensor 1 is low.	Current Sensor 1 Raw A/D	< 0.2 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Current Sensor 1 (-30 to 30 A) High	P0AC2	This DTC indicates that Current Sensor 1 is high.	Current Sensor 1 Raw A/D	> 4.8 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Current Sensor 2 Low	P1A48	This DTC indicates that Current Sensor 2 is low.	Current Sensor 2 Raw A/D	< 0.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Current Sensor 2 High	P1A49	This DTC indicates that Current Sensor 2 is high.	Current Sensor 2 Raw A/D	> 4.5 Volts	Sys Pwr Mode Buffered +5V DTC	RUN or SERVICE != FAIL	188 test failures in 250 test samples Frequency: 1 sample/20ms	Two Trips
Current Performance Golden Range Check	P0AC0	This DTC ensures the zero point for both current sensors is set within a good range.	Low Range Zero Point Raw A/D	outside of 2.5V +/- 0.7%	Sys Pwr Mode	RUN or SERVICE	1 test failure in 1 test sample Frequency: 1 sample/20ms	Two Trips
			High Range Zero Point Raw A/D	outside of 3.3V +/- 1%	Current Sensor DTCs Buffered +5V DTC	PASSED != FAIL		
			OR			Contactors Cmmnd	transition to CLOSED	
Current Performance Correlation		This DTC ensures that the difference between the two	Current Sensor 1 - Current Sensor 2	> 5 A	Sys Pwr Mode Current Sensor DTCs	RUN or SERVICE PASSED	188 test failures in 250 test samples	

08 GRP08a BAS Hybrid ESCM

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Check		sensors is not too large.			Current Sensor 1 & 2	VALID	Frequency: 1 sample/20ms	
					Buffered +5V DTC	!= FAIL		
		Current Sensor 1			> -30 A <30 A			
		Current Sensor 2			> -350 A < 150 A			