

07_GRP11_BAS SGCM.doc

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Starter/Generator Phase U-V-W Correlation	P1AAE	To detect electrical failure of phase current sensor.	Sum of 3 phase current is normally zero. It is greater or less than +/- 200 A for 4 times of 5ms (20ms)(3 times of 119us is temporary flag in 5ms)	Main relay is Closed.	4 fails in 20ms Frequency: 1 sample/ 5ms where one sample = 3 samples of 119us	B
Starter/Generator Phase U-V-W Current Sensor Overcurrent	P1AB1	To detect 3 Phase over current and to protect MOSFET.	Over current signal set for 4 times of 5ms (20ms)(Hardware protection @ 1000A)	WakeUp signal is On.	4 fails in 20ms Frequency: 1 sample/ 5ms	B
Starter/Generator Phase U Current Sensor Circuit Low Voltage	P1AB3	Circuit Low monitor to detect the failure of U-phase current sensor circuit below valid range	Sensor output voltage at highside less than 0.5 V for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us	B
Starter/Generator Phase U Current Sensor Circuit High Voltage	P1AB4	Circuit High monitor to detect the failure of U-phase current sensor circuit above valid range	Sensor output voltage at highside greater than 4.50 V for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us	B
Starter/Generator Phase V Current Sensor Circuit Low Voltage	P1AB5	Circuit Low monitor to detect the failure of V-phase current sensor circuit below valid range	Sensor output voltage at highside less than 0.5 V for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us	B
Starter/Generator Phase V Current Sensor Circuit High Voltage	P1AB6	Circuit High monitor to detect the failure of V-phase current sensor circuit above valid range	Sensor output voltage at highside greater than 4.50 V for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us	B
Starter/Generator Phase W Current Sensor Circuit Low Voltage	P1AB7	Circuit Low monitor to detect the failure of W-phase current sensor circuit below valid range	Sensor output voltage at highside less than 0.5 V for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us	B
Starter/Generator Phase W Current Sensor Circuit High Voltage	P1AB8	Circuit High monitor to detect the failure of W-phase current sensor circuit above valid range	Sensor output voltage at highside greater than 4.50 V for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us	B

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Hybrid Battery System Voltage High	P0AFB	To detect over voltage and to protect MOSFET.(Load dump)	In the hardware, Over voltage signal from protection circuit set for 4 times of 5 ms. (set above 56V, clear below 53V) In the software, 36V output voltage is greater than 50V for 4 times of 119us (5ms).	In the hardware, WakeUp signal is On. In the software, Control module voltage is greater than 10V. && Main relay is Closed.	4 fails in 20ms Frequency: 1 sample/ 5ms 4 fails in 2 Frequency: 1 sample/ 119us	B
Starter/Generator Control Module Hybrid Battery Voltage Sense Circuit Low Voltage	P1A97	Circuit Low monitor to detect the failure of 36V output voltage sensor circuit below valid range	Sensor signal is less than 0.2V for continuous 4 times of 5ms (To detect 42V DC cable open.) Sensor signal is less than 0.2V 4 times of 5ms && 36V Battery voltage - 36V output voltage greater than 5V 4 times of 5ms (20ms).	36V voltage from BDU (42VIN) > 0V. && Main relay is closed. && V42IN is Invalid flag is OFF.	4 fails in 20ms Frequency: 1 sample/ 5ms	B
Starter/Generator Control Module Hybrid Battery Voltage Sense Circuit High Voltage	P1A98	Circuit High monitor to detect the failure of 36V output voltage sensor circuit above valid range	Sensor signal is greater than 4.0 V (64.6V) && 36V Battery voltage - 36V output voltage greater than 5V for 4 times of 5ms (20ms).	36V voltage from BDU (42VIN) > 0V. && Main relay is closed. && V42IN is Invalid flag is OFF.	4 fails in 20ms Frequency: 1 sample/ 5ms	B
Hybrid System Voltage	P0AF8	To correlation of ESCM Battery Voltage and SGCM output Voltage to detect 3 phase cable open, or fuse/relay 's failure.	36V Battery voltage - 36V output voltage greater than 5V for 800 times of 5ms (4 sec).	36V voltage from BDU (42VIN) > 0V. && Main relay is closed. && V42IN is Invalid flag is OFF.	800 fails in 4 seconds Frequency: 1 sample/ 5ms	B
Starter/Generator Phase U-V-W Circuit	P1AAF	To detect phase wire open/short.	ACR output is greater than 200 A for 5 times of 40ms (200 ms) (To detect phase wire open condition)	Main relay is closed.	5 fails in 200ms Frequency: 40ms	B

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14 Volt Power Module Voltage Sensor Circuit Low Voltage	P1A8D	Circuit Low monitor to detect the failure of APM 12V voltage sensor circuit below valid range	Sensor output voltage is less than 0.2V for 4 times of 119us (0.5ms). && 12V power supply - 12V output voltage greater than 5V for 4 times of 119us (0.5ms).	WakeUp signal is On.	4 fails in 20ms Frequency: 1 sample/ 119us	B
14 Volt Power Module Voltage Sensor Circuit High Voltage	P1A8E	Circuit High monitor to detect the failure of APM 12V voltage sensor circuit above a valid range	Sensor output voltage is greater than 3.84V(30.2V) for 4 times of 119us (0.5ms) && 12V power supply - 12V output voltage greater than 5V for 4 times of 119us (0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/ 119us 4 fails in 2ms Frequency: 119us	B
Starter/Generator Control Module System Voltage Performance	P1A70	Performance monitor to detect 12V DC wire electrical failure by comparing the 12v input to the 12v output values if the difference is greater than 5 v then fail	12V power supply - 12V output voltage greater than 5V for 8 times of 119us, and any fault during 15 seconds wait period.	APM voltage sensor fault have not occurred. (No P1A8D, No P1A8E)	8 fails in 20ms Frequency: 1 sample/ 119us	B
14 Volt Power Module Current Sensor Circuit Range/Performance	P0A87	Performance Monitor to detect the failure of APM current sensor circuit.	APM_Status : current limit Buck mode IR1 - IR_HI > 130A * 30% for 5 times of 5ms(25ms) Boost mode IR1 - IR_LOW > 130A * 30% for 5 times of 5ms(25ms)	APM current (IR1) is restricted by maximum current (IR_HI or IR_LOW). && In case of Buck mode IR1 - IR_HI > 39A for 5 times of 5ms (25ms). In case of Boost mode IR1 - IR_LOW > 39A for 5 times of 5ms (25ms). IR1 : APM current, IR_HI : APM buck mode current limit (+130A) IR_LOW : APM boost mode current limit (-130A) APM Output voltage (V14OUT) is greater than 7V, and 42V Output voltage (V42OUT) is greater than 28V.	5 Fails in 25ms Frequency: 80ms	B

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14 Volt Power Module Current Sensor Circuit Low Current	P0A88	Circuit Low Monitor to detect the failure of APM current sensor circuit.	Sensor signal for APM is less than 0.5V (-376A) for 4 times of 119us (0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/119us	B
14 Volt Power Module Current Sensor Circuit High Current	P0A89	Circuit High Monitor to detect the failure of APM Current sensor circuit.	Sensor signal for APM is greater than 4.5V(376A) for 4 times of 119us(0.5ms).	WakeUp signal is On.	4 fails in 2ms Frequency: 1 sample/119us	B
14 Volt Power Module Current Sensor Overcurrent	P1A8F	To detect over current and to protect MOSFET. In the hardware an over current protection circuit is used to limit the current, and software monitors for an over current reading in the sensor	36V Over current signal (36VIOVER)set for 4 times of 5ms (20ms). (hardware protection @250A) 12V Over current signal (12VIOVER)set for 4 times of 5ms (20ms).(hardware protection @250A) Software is greater than 150A or less than -150A for 25 times of 80ms (2 s).	WakeUp signal is On.	Hardware:4 fails in 20ms Frequency: 1 sample/119us Software: 25 fails in 2 s Frequency: 80ms	B
14 Volt Power Module Stuck Off	P1A93	To check APM On/Off, DC - DC direction is commanded ON but converter is OFF	Buck Mode 12V output voltage - 12V command voltage greater than 0.2V for 200 times of 5ms (1s). Boost Mode 36V output voltage - 36V command voltage greater than 0.2V for 200 times of 5ms (1s).	WakeUp signal is On.	200 fails in 1 second Frequency of 5ms	B
14 Volt Power Module Stuck On	P1A94	To detect APM on when it is not commanded on causing a large current output.	DC-DC direction is OFF, but converter remains ON, APM current is greater than \pm 20A for 200 times of 5ms(1s).	WakeUp signal is On.	200 fails in 1 second Frequency of 5ms	B

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DC/DC Converter Stuck in 14-42 Volt Direction	P1A95	To detect APM fault when the APM is commanded in the Boost mode but is set to Buck mode causing an over current.	When DCDC direction indicates 42-14 direction, but the converter stays in the 14-42 direction, current is greater than 20A for 200 times of 5ms(1s).	APM set to Boost mode.	200 fails in 1 second Frequency of 5ms	B
DC/DC Converter Stuck in 42-14 Volt Direction	P1A96	To detect APM fault when the APM is commanded in the Buck mode but is set to Boost mode causing an over current	When DCDC direction indicates 14-42 direction, but the converter stays in the 42-14 direction ,current is less than -20A for 200 times of 5ms(1s)	APM set to Buck Mode	200 fails in 1 second Frequency of 5ms	B
14 Volt Power Module Temperature Sensor Performance	P1A90	To detect the failure of APM temperature sensor circuit by taking the average of the 2 PIM sensors and subtracting the Module temperature and looking for a large difference. This can be done because the sensors are on the same board close together.	DDTEMP - (PIMTEMP1+PIMTEMP2)/2 > 55degC for 100 times of 20ms(2.0s)	APM over temp fault does not occur. (P0AF7) && APM temp sensor circuit (High/Low) fault does not occur. (P1A91, P1A92)	100 fails in 2sec Frequency of 20ms	B
Auxiliary Transmission Fluid Pump Motor Pump Supply Voltage Circuit/Open	P0B09	To detect the Auxiliary Transmission Fluid Pump supply relay circuit is faulted by an error feedback line.	LSD wire open or short to ground fault Echo-back signal (Low) does not match to the LSD output signal (CVTP1_D:High) for 4 times of 80ms(320ms). LSD over current fault or LSD wire short to power line fault Echo-back signal (High) does not match to the LSD output signal (CVTP1_D:Low) for 4 times of 80ms(320ms).	WakeUp signal is On.	4 times in 320ms Frequency of 80ms	B

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Auxiliary Transmission Fluid Pump Control Circuit/Open	P2796	To detect the Auxillary Transmission Fluid Pump control PWM circuit is faulted using error feedback line.	HPD over current or wire short to power line fault Echo-back signal (CVTPERR) is greater than Max threshold(+30%) for 25 times of 40ms(1s). HPD wire open or HPD wire short to ground fault Echo-back signal (CVTPERR) is less than Min threshold(-30%) for 25 times of 40ms(1s).	WakeUp signal is On.	25 times in 1 sec Frequency of 40ms	B
Starter/Generator Control Module Temperature Sensor Performance	P1A7B	To determine if the sensor is reading correctly, by comparing it to average of 3 other sensors after 480min soak.	Ave(PIMTEMP1,PIMTEMP2,APMTEMP) - BOARDTEMP greater than 30 degC && Engine Off Timer greater than 480min 1time of start up.	1. Board Over Temp fault does not occur. (Not P0A7C) 2. Board temp sensor circuit (High/Low) does not have a fault. (Not P1A7C, Not P1A7D) 3. Engine Off Timer greater than 480min, first engine crank.	1 time Frequency after soak of 480min	B
Starter/Generator Control Module Temperature Sensor Circuit Low Voltage	P1A7C	To detect failure of temperature sensor shorted high.	Sensor output voltage is less than 0.2 V(200degC) for 10 times of 100ms(1s).	Board Over Temp fault does not occur. (Not P0A7C)	10 fails in 1 sec Frequency of 100ms	B
Starter/Generator Control Module Temperature Sensor Circuit High Voltage	P1A7D	To detect failure of temperature sensor shorted Low	Sensor output voltage greater than 4.6V(-14.3degC) && PIMTEMP1 greater than 80degC && PIMTEMP2 greater than 80degC && APMTEMP greater than 80degC for 10 times of 100ms (1s)	Board Over Temp fault does not occur. (Not P0A7C)	10 fails in 1 sec Frequency of 100ms	B

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Starter / Generator Control Module Lost Communication With Battery Energy Control Module	U1897	To detect loss of communication on the CAN bus with the ESCM module base on messages \$220, \$484, \$486	5 out of 5 timeouts based on the "GensigTimeoutTime" for each message from BDU. No CAN data from BDU for 3.5 sec. Each message timeout is measured separately. (Reception error), sum error or rolling counter error.	WakeUp is On.	5 fails out of 5 Message rate of CAN messages \$220, \$484, \$486	B
Starter/Generator Control Module Lost Communication With Engine Control Module (ECM)	U1899	To detect the loss of communication on the CAN bus with the ECM module base on messages \$260, \$350, \$440	5 out of 5 timeouts based on the "GensigTimeoutTime" for each from ECM. No CAN data from ECM for 3.5 sec. Each message timeout is measured separately. (Reception error), sum error or rolling counter error.	WakeUp is On.	5 fails out of 5 Message rate of CAN messages \$260, \$350, \$440	B
Starter/Generator Field Coil Circuit	P1AA7	To detect a fault in the field coil circuit fault in the Motor Generator from the error feedback line	Field coil current - Command current) greater than 0.5A for 100 times of 10ms (1.0s).	WakeUp is On.	100 fails in 1sec Frequency of 10ms	B
Engine Hood Switch Circuit	P254F	To detect a fault in the vehicle hood switch	Hood Switch1 signal = Hood Switch2 signal for 5 times of 20ms (100ms). (ex.Hood Switch1 is high and Hood Switch2 is high or Hood Switch1 is low and Hood Switch2 is low)	WakeUp is On.	5 fails in 100ms Frequency: 20ms	B
Starter/Generator Control Module System Voltage Low	P1A6D	To detect the system voltage sensor is shorted low	Sensor output voltage is less than 0.2 V (1.56V) && 12V power supply - 12V output voltage greater than 5V for 4 times of 119us (0.5ms).	WakeUp is On.	4 fails in 2ms Frequency: 119us	B
Starter/Generator Control Module System Voltage High	P1A6E	To detect the system voltage sensor is shorted high	Sensor output voltage is greater than 3.84 V (30.0V) && 12V power supply - 12V output voltage greater than 5V for 4 times of 119us (0.5ms).	WakeUp is On.	4 fails in 2ms Frequency: 119us	B

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Starter/Generator Control Module Internal Performance	P0A1E	CPU calculation error, ACR task check error, dual path error, sub CPU error, clock monitor check	CPU calculation error, ACR task check error, dual path error, sub CPU error, clock monitor check	WakeUp is On.	1 fail Frequency: at Wakeup	B
Starter/Generator Control Module Internal Driver Error	P1A63	To detect a fault in the internal drive error. Gate driver error flag from driver IC is low. (Gate driver voltage error, PWM output logic error)	"Gate driver voltage fault signal is low" OR "PWM logic error fault signal is low".	WakeUp is On.	1 fail Frequency: at Wakeup	B
Starter/Generator Control Module Random Access Memory (RAM)	P1A69	To detect an error in the SGCM RAM write area.	RAM check error	WakeUp is On.	1 fail Frequency: at Wakeup	B
Starter/Generator Control Module Read Only Memory (ROM)	P1A6A	To detect an error in the SGCM ROM using a checksum calculation	ROM check error Calculated ROMSUM value does not match with defined value.	WakeUp is On.	1 fail Frequency: at Wakeup	B
Starter/Generator Control Module 5 Volt Reference Circuit	P1A6B	To detect a fault in the 5 volt reference circuit	5V reference fault 5V input AD value(2 byte) is out of following range for 10 times of 10ms (100ms). ave_vbb_chk (497 to 575) ave_vcc_chk (496 to 528) ave_vn_chk (499 to 453) ave_vref_chk (482 to 542)	WakeUp is On.	10 fails in 100ms Frequency: 10ms	B
Motor Torque Delivered Performance	P1A62	To detect the delivered Torque value is not within tolerance meaning that the MGU is not able to deliver the requested torque.	Compare the internal torque value (DTRQ1FLT) with the Delivered Torque value to come up with a torque error. If the torque error is greater than 10Nm for 100 times of 10ms(1s).	WakeUp is On. Normal Charge mode with external set point	100 fails in 1 second Frequency: 10ms	B

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Generator Temperature Sensor Circuit Range/Performance	P0A37	To detect the performance of the motor generator temperature sensor to validate is within range of the other temperature sensors, by comparing it to the other sensors it controls.	$ Ave(PIMTEMP1, PIMTEMP2, APMTEMP, BOARDTEMP) - MGUTEMP $ greater than 30 degC && Engine Off Timer greater than 480min 1time of start up.	1. Motor Over Temp fault does not occur. (Not P0A3B) 2. Motor temp sensor circuit (High/Low) does not have a fault. (Not P0A38, Not P0A39) 3. The first engine cranking after wakeup on, Engine off time greater than 480min	test fails at wakeup	B
Generator Temperature Sensor Circuit Low	P0A38	To detect the Motor Generator temperature sensor is shorted low	Sensor output voltage less than 0.2V (280degC) for 10 times of 100ms(1s).	1. Motor Over Temp fault does not occur. (Not P0A3B)	10 fails in 1 sec Frequency 100ms	B
Generator Temperature Sensor Circuit High	P0A39	To detect the Motor Generator temperature sensor is shorted high	Sensor output voltage greater than 3.95V(20degC)&& PIMTEMP1 greater than 80degC && PIMTEMP2 greater than 80degC && APMTEMP greater than 80degC for 10 times of 100ms(1s).	1. Motor Over Temp fault does not occur. (Not P0A3B) 2. PIM temp abd APM temp are over than 80 degC.	10 fails in 1 sec Frequency 100ms	B
Starter/Generator Inverter Phase U Temperature Sensor Performance	P1A9B	To detect the failure of inverter temp sensor circuit using rationality of other temperature sensors to determine if it is out of range	$ PIMTEMP1 - (DDTEMP+PIMTEMP2)/2 > 55degC$ or $ PIMTEMP2 - (DDTEMP+PIMTEMP1)/2 > 55degC$ for 100 times of 20ms(2.0s)	1. V Phase or W Phase Over Temp fault does not occur. (Not P1A9E)(Not P1AA2) 2. V Phase or W Phase temp sensor circuit (High/Low) does not have a fault. (Not P1A9C, Not P1A9D)(Not P1AA0, Not P1AA1)	100 fails in 2sec Frequency 20ms	B
Starter/Generator Inverter Phase U Temperature Sensor Circuit Low Voltage	P1A9C	To detect the inverter phase u temperature sensor is shorted low	Sensor output voltage is less than 0.2 V(200degC) 50 times of 20ms (1.0 s)	1. V Phase or W Phase Over Temp fault does not occur. (Not P1A9E)(Not P1AA2)	50 fails in 1sec Frequency 20ms	B

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Starter/Generator Inverter Phase U Temperature Sensor Circuit High Voltage	P1A9D	To detect the inverter phase u temperature sensor is shorted high	Sensor output voltage greater than 4.6 V(-14.3degC) && PIMTEMP1 - (DDTEMP+PIMTEMP2)/2 > 55degC for 50 times of 20ms(1s).	1. V Phase or W Phase Over Temp fault does not occur. (Not P1A9E)(Not P1AA2)	50 fails in 1sec Frequency 20ms	B
Starter/Generator Inverter Phase V Temperature Sensor Circuit Low Voltage	P1AA0	To detect the inverter phase v temperature sensor circuit is shorted low	Sensor output voltage is less than 0.2 V(200degC) for 50 times of 20ms (1.0 s)	1. V Phase or W Phase Over Temp fault does not occur. (Not P1A9E)(Not P1AA2)	50 fails in 1sec Frequency 20ms	B
Starter/Generator Inverter Phase V Temperature Sensor Circuit High Voltage	P1AA1	To detect the inverter phase v temperature sensor circuit is shorted high	Sensor output voltage greater than 4.6 V(-14.3degC) && PIMTEMP2 - (DDTEMP+PIMTEMP1)/2 > 55degC for 50 times of 20ms(1s).	1. V Phase or W Phase Over Temp fault does not occur. (Not P1A9E)(Not P1AA2)	50 fails in 1sec Frequency 20ms	B
Generator Position Sensor Circuit	P0A4B	To detect Loss of speed signal or converter error (line open, short) in the Motor Generator position sensor circuit	R/D converter error (loss of signal or tracking) for 100ms	WakeUp is On.	Fail for 100ms Frequency: 5ms	B
Generator Position Sensor Circuit Range/Performance	P0A4C	To detect a fault in the angle data read by the motor generator position sensor circuit.	(data error) R/D IC angle data does not match with micro computer angle data. (initialization error)self check fault when initial sequence	WakeUp is On.	1 fail Frequency at init	B
Generator Position Sensor Circuit Overspeed	P0A50	To detect an over speed condition in the motor generator position sensor circuit	absolute motor speed is greater than 21000rpm for 2 times of 5 ms(10ms).	WakeUp is On.	2 fails in 10ms Frequency 5ms	B
Motor Electronics Coolant Pump Control Circuit Low High	P0A06	To detect control voltage relay circuit open or short to ground fault for the SGCM coolant pump	Over current or wire short to power line fault Eco-back signal (High) does not match to the LSD output signal (COOIP_D:Low) for 4 times of 80ms.	WakeUp is On.	4 fails in 320ms Frequency 80ms	B

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Motor Electronics Coolant Pump Control Circuit High Low	P0A07	To detect the PWM circuit open or short to ground fault of the SGCM coolant pump	Wire open or short to ground fault Eco-back signal (Low) does not match to the LSD output signal (COOIP_D:High) for 4 times of 80ms.	WakeUp is On.	4 fails in 320ms Frequency 80ms	B