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GE Energy Services

**Functional Testing Specification***Parts & Repair Services  
Louisville, KY.***LOU-GED-151X1225EK01PC03****Test Procedure for Wind Battery Charger****DOCUMENT REVISION STATUS: Determined by the last entry in the "REV" and "DATE" column**

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	Roger Johnson	7/13/2012
B	Updated the status code descriptions on page 13	R. Johnson	8/2/2012
C	Added load test for RC2G model and revision changes to section 7	R. Johnson	8/6/2012
D	Added section 6.4, note on labeling units 104W5205R001 & 151X1225EK01PC03 and section 6.1.1.1 on upgrading all units to R8 revision.	C. Wade	8/14/2012
E	Removed steps concerning Chill Spray due to possibility of damaging UUT	Steve Pharris	4/22/15

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### Functional test procedure for: Wind Battery Charger

#### 1. SCOPE

1.1 This is a functional testing procedure for the Wind Battery Charger.

#### 2. STANDARDS OF QUALITY

2.1 Refer to the current revision of the IPC-A-610 standard for workmanship standards.

#### 3. APPLICABLE DOCUMENTS

3.1 The following document(s) shall form part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.

3.1.1 Check board's electronic folder for more information.

#### 4. ENGINEERING REQUIREMENTS

##### 4.1 Equipment Cleaning

4.1.1 Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to site specific SRA's for cleaning guidelines.

##### 4.2 Equipment Inspection

4.2.1 Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:

4.2.1.1 Wires broken or cracked

4.2.1.2 Terminal strips / connectors broken or cracked

4.2.1.3 Loose wires

4.2.1.4 Components visually damaged

4.2.1.5 Capacitors leaking

4.2.1.6 Solder joints damaged or cold

4.2.1.7 Circuit board burned or de-laminated

4.2.1.8 Printed wire runs burned or damaged

#### 5. EQUIPMENT REQUIRED

5.1 The following equipment is required to perform the process requirements. Equipment may be substituted provided that all accuracy's and test ratios are equivalent or better.

Qty	Reference #	Description
1		DC POWER SUPPLY
2		Fluke 85 DMM or equivalent
1	H188896	WIND BATTERY CHARGER TESTER
1		Variable transformer

## 6. TESTING PROCESS

**Special Note: ALL GROUNDS ARE CONNECTED TOGETHER**

### 6.1 Setup

- 6.1.1.1 All units should be upgraded to a R8 revision, see section 7, Notes.
- 6.1.1.2 Install battery charger on the tester marked UUT.
- 6.1.1.3 DO NOT CONNECT PL1, PL2 AND PL3 AT THIS TIME.
- 6.1.1.4 Connect a DMM to AC INPUT DMM.
- 6.1.1.5 Connect a DMM to DC VOLTAGE OUTPUT.
- 6.1.1.6 Connect a power supply to DC POWER SUPPLY 0 VOLT TO 20 VOLT VARIABLE.
- 6.1.1.7 Ensure variable load is fully clockwise.
- 6.1.1.8 Ensure ERROR-245 and ERROR-231 in the off position.

### 6.2 Testing Procedure

- 6.2.1 Turn on the MASTER POWER switch. The master power switch does not power the computer.
- 6.2.2 Turn on the variable transformer.
- 6.2.3 Turn on the UUT power and set the voltage to 230VAC.
- 6.2.4 After setting the voltage turn off the UUT POWER switch.
- 6.2.5 Now connect PL1, PL2 and PL3 to the battery charger (UUT).
- 6.2.6 Now set the address switches to address ZERO.

Node Address	GE Sentry 0	1	2	3	4	5	6	7	8	9
SW1	POS2	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	POS2	POS2
SW2	POS1	OPEN	OPEN	OPEN	POS2	POS2	POS1	POS1	OPEN	OPEN
SW3	OPEN	OPEN	POS2	POS1	OPEN	POS1	OPEN	POS2	OPEN	POS1

**\*NOTE\* GE SENTRY WILL ONLY COMMUNICATE WITH ADDRESS ZERO\***

- 6.2.7 Start GE Sentry by double clicking the GE\_Sentry icon.
- 6.2.8 The UUT address must be set to address zero for GE Sentry, the address switches are power on read.
- 6.2.9 Address Zero put SW1 to position 2, SW2 to position 1 and SW3 open or center position.
- 6.2.10 Ensure PL1, PL2 and PL3 are connected.

- 6.2.11** Watch the boot sequence when power is first applied all LED's will blink 3 times, then DS1 thru DS3 will blink then all LED's will again blink 3 times.
- 6.2.12** When the unit has completed DS1 (RED) and DS3 (GREEN) should be on.
- 6.2.13** Now power on the UUT switch and watch for the sequence.
- 6.2.14** The charger should start booting.
- 6.2.15** If the unit booted ok, cycle the UUT power switch, while the unit boots try to connect using the GE Sentry software, locate the GE Sentry dropdown then single click and Monitor dropdown should be displayed and single click monitor.
- 6.2.16** The monitor must be started before the unit has completed booting or it will not connect.
- 6.2.17** The popup monitor should now be displayed notice when this popup opens the unit halted its POST, this halted boot process is normal.
- 6.2.18** Now click the START button the unit should now complete the boot process.
- 6.2.19** After clicking the start button another popup window should be displayed.
- 6.2.20** Stating TURN THE KEY' SWITCH TO ON POSITION.
- 6.2.21** Click ok.
- 6.2.22** When the unit has completed booting information should be displayed on the screen and the FRAMES window should be counting.
- 6.2.23** Locate the SW-REV ID'S this window displays the current firmware revision installed in the unit. RC2C for example will be displayed.
- 6.2.24** Unit should display is status window- **BATTERY VOLTS LOW CODE ERROR 215**
- 6.2.25** Now confirm the data displayed in the value column

MODE=	0	REGULATED VOLTAGE=	14.4
STATUS=	<b>215</b>	12 VOLT BUSS	134-150
BATTERY VOLTS=	0	FREQUENCY=	60
CHARGE CURRENT=	x.xx	COUHR=	x.xx
TEMPERATURE=	22-29	PLMC=	x.xx
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

- 6.2.26** Ensure a DMM is connected to DC VOLTAGE OUTPUT.
- 6.2.27** Set the DC power supply to zero volts then power it on.

**6.2.28** Slowly increase the DC power supply while observing the battery volts data window. The charger should hold in fault condition until there is 10 volts displayed in the BATTERY volts window.

**6.2.29** When the trigger voltage is enough the supply will start and the RED fault LED should go off.

**6.2.30** Now confirm the data displayed in the value column **MODE 1 CURRENT REGULATION**.

MODE=	1	REGULATED VOLTAGE=	14.4
STATUS=	0	12 VOLT BUSS	120-130
BATTERY VOLTS=	>10	FREQUENCY=	60
CHARGE CURRENT=	1.8-2A	COUHR=	x.x
TEMPERATURE=	22-29	PLMC=	90
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.31** Continue to slowly increase the DC SUPPLY while observing the BATTERY VOLTS.

**6.2.32** When 14.3 volts is reached the AMBER LED should turn on.

**6.2.33** Now confirm the data displayed in the value column **MODE 2 VOLTAGE REGULATION**.

MODE=	2	REGULATED VOLTAGE=	14.4
STATUS=	0	12 VOLT BUSS	120-130
BATTERY VOLTS=	>14.3	FREQUENCY=	60
CHARGE CURRENT=	Dropping	COUHR=	0
TEMPERATURE=	22-29	PLMC=	90 then drops
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.34** Now VERY SLOWLY increase the DC SUPPLY again while observing the BATTERY VOLTS and CHARGE CURRENT.

**6.2.35** When BATTERY VOLTS equals 14.7 volts the charge current should drop to ZERO.

**6.2.36** All the current should now be supply by the DC POWER SUPPLY.

**6.2.37** Verify the DC SUPPLY it should be about 2.8 amps or greater.

**6.2.38** Now confirm the data displayed in the value column **MODE 3 TRICKLE CHARGE (FLOAT).**

MODE=	3	REGULATED VOLTAGE=	13.6
STATUS=	0	12 VOLT BUSS	134-150
BATTERY VOLTS=	>14.7	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	22-29	PLMC=	9.7
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.39** Now VERY slowly decrease the DC SUPPLY until the BATTERY VOLTS reads 13.8 volts.

**6.2.40** The battery charger should be in FLOAT MODE this mode can be maintained indefinitely with a good battery. With no battery connected after 2.5 hours **BULK dV/dt code ERROR 201** should be displayed.

**6.2.41** All the current should now be supply by the DC POWER SUPPLY.

**6.2.42** Verify the DC SUPPLY decreased it should be about 2.5 amps.

**6.2.43** Now very quickly turn the DC SUPPLY to ZERO volts.

**6.2.44** After 5 seconds the supply should test the battery volts and the AMBER LED should turn off the GREEN LED (DS3) only should be on.

**6.2.45** Now confirm the data displayed in the value column.

MODE=	1	REGULATED VOLTAGE=	14.4
STATUS=	0	12 VOLT BUSS	120-130
BATTERY VOLTS=	5	FREQUENCY=	60
CHARGE CURRENT=	2	COUHR=	0
TEMPERATURE=	22-29	PLMC=	82
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.46** Next increase the DC SUPPLY back until battery volts is 14.4 volts.

**6.2.47** Verify the AMBER LED turn back on.

**6.2.48** Now confirm the data displayed in the value column.

MODE=	2	REGULATED VOLTAGE=	14.4
STATUS=	0	12 VOLT BUSS	120-130
BATTERY VOLTS=	14.4	FREQUENCY=	60
CHARGE CURRENT=	Apx 1.5	COUHR=	0
TEMPERATURE=	22-29	PLMC=	90 dropping @ Max
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.49** Increase the DC SUPPLY until battery volts is again 14.7 volts.

**6.2.50** Verify the CHARGE CURRENT is dropping and when it reads .4 the mode changes to MODE 3.

**6.2.51** Now confirm the data displayed in the value column.

MODE=	3	REGULATED VOLTAGE=	13.6
STATUS=	0	12 VOLT BUSS	134-150
BATTERY VOLTS=	>14.7	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	22-29	PLMC=	9.7
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.52** Again turn the DC SUPPLY to ZERO volts and wait 5 seconds for battery test.

**6.2.53** Verify AMBER LED is off and UUT is back in mode 1.

**6.2.54** Flip the **BATTERY NOT THERE CODE ERROR 231** switch to the up position.

**6.2.55** After 2 seconds the RED fault LED should turn on.

**6.2.56** Now confirm the data displayed in the value column **MODE 5 FAULTED**.

MODE=	5	REGULATED VOLTAGE=	14.5
STATUS=	231	12 VOLT BUSS	134-150
BATTERY VOLTS=	0	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	22-29	PLMC=	90
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.57** Flip the ERROR 231 back to the down position.

**6.2.58** Increase the DC SUPPLY until the BATTERY VOLTS read 5 volts the error should clear and change back to MODE 1.

**6.2.59** Now confirm the data displayed in the value column.

MODE=	1	REGULATED VOLTAGE=	14.5
STATUS=	0	12 VOLT BUSS	120-130
BATTERY VOLTS=	>5	FREQUENCY=	60
CHARGE CURRENT=	2	COUHR=	0
TEMPERATURE=	21-29	PLMC=	89
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.60** Turn the DC supply back to zero.

**6.2.61** Now turn the variable load counter clockwise and observe the current while turning the variable load when the current reaches Zero the ERROR 231 should be displayed.



**6.2.62** Now confirm the data displayed in the value column.

MODE=	5	REGULATED VOLTAGE=	14.5
STATUS=	231	12 VOLT BUSS	134-150
BATTERY VOLTS=	0	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	22-29	PLMC=	90
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.63** Now turn the variable load back fully clockwise.

**6.2.64** Increase the DC SUPPLY until the BATTERY VOLTS reads 13 volts.

**6.2.65** Ensure MODE 1 and the GREEN LED only is on.

**6.2.66** Flip the **SCR NOT FIRING CODE ERROR 245** to the up position.

**6.2.67** After two seconds the UUT should go into a fault.

**6.2.68** Now confirm the data displayed in the value column.

MODE=	5	REGULATED VOLTAGE=	14.5
STATUS=	245	12 VOLT BUSS	134-150
BATTERY VOLTS=	>13	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	22-31	PLMC=	90
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.69** Flip the **SCR NOT FIRING CODE ERROR 245** back to the down position.

**6.2.70** Adjust the DC SUPPLY from ZERO to 15 volts.

**6.2.71** Verify the ERROR 245 will not clear and the fault LED stays on.

**6.2.72** Set the DC SUPPLY back to 13 volts.

**6.2.73** Cycle UUT POWER and close the monitor then reconnect to monitor while unit boots.

**6.2.74** Now adjust the variable load counter clockwise this should cause the ERROR 245 again.

**6.2.75** Now confirm the data displayed in the value column with the variable load.

MODE=	5	REGULATED VOLTAGE=	14.5
STATUS=	245	12 VOLT BUSS	134-150
BATTERY VOLTS=	>13	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	21-29	PLMC=	90
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.76** Verify the ERROR 245 will not clear and the fault LED stays on by adjusting the DC supply from 0 volts to 15 volts.

**6.2.77** Set the variable load back fully clockwise.

**6.2.78** Now set the DC supply to 13.8 volts.

**6.2.79** Close the monitor program.

**6.2.80** Turn off the UUT POWER switch.

**6.2.81** Connect a DMM to AC INPUT DMM.

**6.2.82** Turn the UUT POWER back on and restart the monitor to connect to the unit.

**6.2.83** The ERROR 245 should clear and STATUS 0 should be displayed.

**6.2.84** Now decrease the variable transformer down while observing the STATUS line of the UUT.

**6.2.85** When AC INPUT voltage is less than 160 VAC ERROR 218.

**6.2.86** Now confirm the data displayed **AC LINE VOLTAGE LOW**.


MODE=	5	REGULATED VOLTAGE=	14.5
STATUS=	218	12 VOLT BUSS	90-100
BATTERY VOLTS=	>13	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	25-32	PLMC=	90
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

**6.2.87** Turn variable transformer back to 230VAC and the **AC LINE VOLTAGE LOW ERROR 218** should clear.

- 6.2.88** Turn off the UUT POWER and SET the DC SUPPLY to 15.5 volts.
- 6.2.89** Verify the unit comes up with **BATTERY VOLTS HIGH CODE ERROR 216** in the status line.
- 6.2.90** Decrease the DC SUPPLY down below 15 volts and the error should clear and change to MODE 3 the AMBER LED should be on.
- 6.2.91** Now confirm the data displayed.

MODE=	3	REGULATED VOLTAGE=	13.6
STATUS=	0	12 VOLT BUSS	134-150
BATTERY VOLTS=	<15.5	FREQUENCY=	60
CHARGE CURRENT=	0	COUHR=	0
TEMPERATURE=	22-32	PLMC=	9.7
LOAD TEST=	0	SHUTDOWN FAULT=	NO FAULT
NODE I.D. =	0		

- 6.2.92** With a heat gun heat up TR1 it is located on the right side of the unit just below U5.
- 6.2.93** Use caution not to overheat the board.
- 6.2.94 Ambient Temperature High Code ERROR 241** Observe the TEMPERATURE counts when it reaches 208 and the TEMP is 80C.
- 6.2.95** The unit should change to MODE 5 and STATUS ERROR 241 should be displayed.
- 6.2.96** Remove the heat source and the error should clear.
- 6.2.97** Now turn off the UUT POWER switch and set the address of the UUT to address 1.
- 6.2.98** SW1 OPEN, SW2 OPEN and SW3 OPEN center position.
- 6.2.99** Close GE Sentry software.
- 6.2.100** Open Docklight by double clicking the desktop icon.
- 6.2.101** Click continue
- 6.2.102** Go to file and Double click on WP\_chager\_proj.ptp
- 6.2.103** Then locate the scripting dropdown click it and arrow down to open Script then single click.
- 6.2.104** Double click WP\_charger\_script.pts.
- 6.2.105** Click scripting again and then click run script.

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**6.2.106** Now power on the UUT POWER switch.

**6.2.107** On the left side of the software locate the item labeled read mode status node 1.

**6.2.108** Single click the tab.

**6.2.109** The communications widow should display. The command 07x is the address of the unit. It pings this address and waits for a return.

DATE      TIME    {TX} --- 071 096 097 008

DATE      TIME    {RX} --- 071 001 000 072

**6.2.110** Now adjust the DC POWER supply up until the DC VOLTAGE OUTPUT measures 15.5 volts and the amber led comes on.

**6.2.111** Next slowly adjust the supply until the DC VOLTAGE OUTPUT 15.9 volts the current on the analog current meter should be dropping to ZERO. When it stops at ZERO adjust the DC VOLTAGE OUTPUT to 13.8 volts.

**6.2.112** On the DC SUPPLY flip the toggle switch to read current on the meter.

**6.2.113** The DC SUPPLY meter should read 2.5 amps.

**6.2.114** There are TWO software ID models the **RC2C** and **RC2G**.

**For the following sections the read test at 6.2.128 must be done during the load, not after.**

**Take a moment to review that section before continuing.**

#### **TO RUN THE RC2C LOAD TEST**

**6.2.115** Locate the tab **Node? Run load Test for RC2C**. Click this tab.

**6.2.116** Type address the UUT is set to in the blank field and then click send.

**6.2.117** It takes about 15 seconds to complete.

**6.2.118** While the test is running the DC OUTPUT CURRENT meter should jump to -1.2 amps and the DC SUPPLY meter should jump to 3.8 amps.

**NOTE:** Also while the load test is running R39 will have 13.3 volts across it when the test starts.

**6.2.119** When the test is complete the DC OUTPUT CURRENT meter should drop back to ZERO amps.

#### **TO RUN THE RC2G LOAD TEST**

**6.2.120** Locate the tab **Node? Run load Test for RC2G**. Click this tab.

**6.2.121** Type address the UUT is set to in the blank field and then click send.

**6.2.122** It takes about 60 seconds or more to complete.

**6.2.123** The command will repeat once every second.

**6.2.124** Allow this command to run until the current on the DC OUTPUT CURRENT meter jumps to -1.2 amps.

**6.2.125** After the DC OUTPUT CURRENT meter should jumps to -1.2 amps the DC SUPPLY meter also jumps to 3.8 amps.

**6.2.126** Click the Node? Run load Test for RC2G **AGAIN** to stop the repeat mode.

**NOTE:** Also while the load test is running R39 will have 13.3 volts across it when the test starts.

**6.2.127** When the test is complete the DC OUTPUT CURRENT meter should drop back to ZERO amps.

### **READ LOAD TEST**

**6.2.128** Now one tab down is the tab Node? Read Load Test.

**6.2.129** Click on read node test to get the results. Type address, 1, and send.

Status code	Description of error code
0	No load test commanded since processor reset
1	Load Test is progress
2	Load Test Passed
3	Load Test Failed: Open Cell
4	Load Test Failed: Current capability/voltage drop
5	Load test ignored charger red fault LED Load TEST will not run
6	Load test failed due to internal circuit problems

```

DATE      TIME    {TX} --- 145 001 000 146 run load test
DATE      TIME    {RX} --- 145 001 000 146
DATE      TIME    {TX} --- 071 101 000 172 read load test
DATE      TIME    {RX} --- 071 002 001 074

```

**NOTE:** 071 is the address on the unit and the second column is the return results.

**6.2.130** If the test passes a 002 will be displayed.

**NOTE:** Now to cause status code 3. Load test failed open cell.

**6.2.131** Decrease the current control on the DC POWER SUPPLY until the Voltage slightly drops.

**6.2.132** Then run load test and read load test as before this will limit the current the test needs.

**6.2.133** The return results should be 071 **003** 001 075.

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**6.2.134** Now turn the current back up to max.

**6.2.135** Flip ERROR 231 up and run test.

**6.2.136** Results 071 **005** 002 078.

**6.2.137** Flip **ERROR 231** back to the down position and the unit should reset back to ok status.

**6.2.138** Now turn off UUT POWER and set SW1 to POS2 and SW2 to POS2.

**6.2.139** Turn UUT POWER back on the unit should boot but will have a RED fault led on.

**6.2.140** Try to connect with address 0 thru 9 it should not respond.

**NOTE:** This **ERROR 205** is bad node address.

**6.2.141** Turn off UUT POWER and set to a known good address and confirm connection.

**6.3 \*\*\*TEST COMPLETE \*\*\***

**6.4 Labeling**

**6.4.1.1** Be sure battery chargers are labeled both with the 104W5205R001 & 151X1225EK01PC03 model numbers.

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## 7. Notes

**7.1** Revision changes for the 104W5205R001 & 151X1225EK01PC03

### **Rev 1 to Rev 2 to Rev 3 (12/20/2007)**

Changed (U9) SCR to Triac (U9 - 328A1533PSP1), replace D19 with a zero ohm resistor (328A1533REP3), replaced R69 & R70 (10K) with a 825 ohm resistor (328A1533RGPE825), removed R61 and leave empty, solder cobble wire (20 or 22 gage wire) from D11 to R61 (empty pad). Re-apply humiseal 1C55 conformal coating and cure as per the mfg instructions.

### **Rev 3 to Rev 4 (3/13/2009)**

Changed to Printed circuit board layout eliminates need for soldered on jumper wire. No functional change.

### **Rev 4 to Rev 5 (11/23/2009)**

Changed the name on the card from 352A1120P1RAM to IS200AEPB. No functional change.

### **Rev 5 to Rev 6 (11/27/2009)**

Changed the fuse to a shurter slow blow (0034.5038). Not implemented on 1.5 due to short supply. Functional change for 2.x product line only

### **Rev 6 to Rev 7 (7/10/2010)**

1. Change FU3 part number from 259A9266P16=FU7 to 64G5006-001=RFU7 in schematic
2. Change R39 part number from 328A1524AZP1 to 64G3515-N100J in schematic
3. Add on sticky label on FU3 fuse holder to identify new fuse part number. The label test is "TT315MA".

Functional change and corrects known issues with fuse and resistor longevity

### **Rev 7 to Rev 8 (Jan 2012)**

Firmware update from RC2C to RC2G

Current Battery charger card is IS200AEPB (352A1120P1RAN).

## 8. Attachments

**8.1** None at this time.