g GE Energy *Parts & Repair Operations* *Louisville, KY*	**Functional Testing Specification** **LOU–GED-IS200SCTL-B**

Test Procedure for an IS200SCTL Static Charger

DOCUMENT REVISION STATUS: Determined by the last entry in the "REV" and "DATE" column

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	John Madden	12/08/06
B	Syntax corrections, addition of visual aids in Section 8	John Madden	6/11/08
C			

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DATE	**DATE**	**DATE**	**DATE**
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1. SCOPE

1.1 This is a functional testing procedure for a Static Charger Three Level Inverter Card.

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 K:\IS2\IS200S\SCTL\Schematics**
- **3.1.2 K:\IS2\IS200S\SCTL\ECN's**
- **3.1.3 K:\IS2\IS200S\SCTL\TEST NOTES.doc**
- **3.1.4 K:\IS2\IS200S\SCTL\Test Layout.pdf**

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 the local documented procedures 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, cracked, or loosely connected
  - **4.2.1.2** Terminal strips / connectors - broken or cracked
  - **4.2.1.3** Components - visually damaged
  - **4.2.1.4** Capacitors - bloated or leaking
  - **4.2.1.5** Solder joints - damaged or cold
  - **4.2.1.6** Circuit board - burned or de-laminated
  - **4.2.1.7** Printed wire runs / Traces - 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	Ref. #	Description
1		Fluke 87 DMM (or Equivalent)
1		Variac, 0-110Vac, preferably with ammeter
1		IS200GDPA test card
1		Two channel o-scope, with differential input capability
1		IS200SCTL test kit (cabling), in cardboard box above test fixture shelving
2	H188563 & 4	5.5 ohm load banks, with red/black banana plugs
1		Fiber-optic transmitter, found in IS200GGXI test kit
1		Tenma Dual Power Supply

6. TESTING PROCESS

6.1 Setup

6.1.1 There is a hand-drawn diagram that shows the proper connections for the test located on the server under **K:\IS2\IS200S\SCTL\Test Layout.pdf**. Connect the components together as follows: In the SCTL test kit there are some cables specially made for this test. One is a 110Vac power cord that connects J3 of the SCTL under test to the ACPL connector of the GDPA test card, and it has a duplicate connector that allows a power cord with the matching 3 pin Molex connector to plug into a wall outlet. Connect the cable to the two cards, and connect a power cord to them. Plug the main power cord into your 0-110Vac variac. Set the variac to 110Vac., but do not apply power yet.

6.1.2 Either the GDPA test card or the SCTL test kit should have a three-wire cable that connects from 1GDPL (2, 3, or 4GDPL works, too) of the GDPA card to J1 of the SCTL card. This provides 50Vac @ 27KHz to power the SCTL's 5Vdc logic and P15 fault detection circuitry. Connect this cable now.

6.1.3 The SCTL kit provides a four-wire cable with a four-pin Molex connector at one end, and at the other end of the two pairs of twisted wire are individual banana plugs to be set into the 5.5 Ohm load banks H188563 & H188564. The four-pin Molex connector plugs into the XFRPL connector on the SCTL card. The two load banks are to simulate the SCTT card's transformer. They put a much heavier load on the board than the SCTT's transformer would, since there is no inductive reactance to cancel out the pure resistive load of the banks. Be sure to set up a cooling fan that blows across the SCTL board and reaches the heat sinks. The power transistors will get very hot in short order once power is applied to the load banks. THIS IS THE BIGGEST REASON FOR THE COOLING FAN MENTIONED IN THE NOTES BELOW…

6.1.4 Now connect the fiber optic transmitter card from the GGXI test kit to one of the outputs of the dual power supply, and set it to 12Vdc. This should make the transmitters light up. Connect a fiber optic cable from one of the transmitters to the blue receiver U7 (labeled CMND on the SCTL card).

6.1.5 Set the oscilloscope as follows: Both channels set to DC, both channels set to 10V/div (1V/div and both probes set to X10 if scope doesn't go up to 10V/div), channel 2 inverted, and vertical mode set to ADD both channels together. Connect channel 1 to XFRPL-1 and channel 2 to XFRPL-2. This can be done directly at one of the load banks.

✍ **Note: This test may seem long, but most of it is setup because you're really only testing a few things: One, that it can recognize when the 110Vac supply is down; Two, that it can regulate it's output if 110Vac drops to 70Vac; that both of it's outputs are roughly equal, and it obeys the input of the fiber optics. This board us used in conjunction with an IS200SCTT transformer card simply to "pre-charge" a capacitor bank on a drive or exciter so that when the main contactor is closed there won't be a nasty arc jump across the contacts, due to the effect of the caps needing a massive influx of current until they're charged. This unit isn't designed to run continuously, so be sure to KEEP A FAN RUNNING ON IT AT ALL TIMES. THIS BOARD IS PUMPING OUT ROUGHLY 1000 WATTS, but isn't really equipped to cool that much power for long periods. Your testing will likely last much longer than the unit was intended to run in the field. That's why you need the fan. If you've studied the schematics, you'll notice this unit is constructed quite similarly to the GDPA card. Don't let this confuse you. Just follow the steps in this test and you'll be ok.**

6.2 Testing Procedure

6.2.1 Power up the unit with the 110Vac power cord at the variac. This should bring up both the GDPA and the SCTL cards. You should notice the green "PSOK " LED's are lit. If you have the fiber optic connection running and plugged in, you should also see the yellow "CHRG" LED's running. This also means that the load banks should be powered with around 80Vac each. This, coupled with the 110Vac input puts the whole operation into **NFPA 70E** restrictions, so keep in mind you must be 12 inches away from any of these components while they're operating. An easy way to do this is to connect your measurement equipment with the whole ball-of-wax powered down and only reach in to power the unit up (or power it up remotely using the variac's power switch.)

6.2.2 Power the unit down. Allowing some time for caps to bleed off, unplug J3 of the SCTL (just J3, leave 110Vac power connection on GDPA). This time when you power up, you should see the red "FAULT" LED's light up. This is telling you that while the SCTL is still receiving 50VAC/27KHz from the GDPA, the 110Vac main power is down (or F1 is blown). The logic is powered from the 27KHz connection, while the 110Vac supplies power for the main charger output. The board is supposed to catch when the 110Vac isn't present (like when F1 is blown), and if you saw the red LED's light up then this function is good. At the same time, the grey fiber optic transmitter U10 (labeled "STATUS") should not have been lit while 110Vac was down. It should light once

110Vac has been re-established, and the red “FAULT” LED’s should go out at that time as well.

6.2.3 With power re-established, apply 12Vdc to the fiber optic array and you should see the output to the load banks appear on the scope. The output is a push-pull type, 80Vac square wave in each direction, with each load bank being ½ of the total picture. They will be 180 degrees out of phase with each other. With output running, you should see roughly 80Vpp on each bank (**MAKE SURE THE FAN IS BLOWING ACROSS THE SCTL!!!**). XFRPL-2 & 3 are the same point electrically, so you only need to move channel 1 on the scope from XFRPL-1 to XFRPL-4 to read each load bank. You should also notice (if your variac has an ammeter built into it) that the whole system draws around 13-14 amps when powering the load banks (fiber optic turned on). By varying the output of the variac from 110Vac down to around 80Vac, you should notice that the current draw remains the same as the unit “throttles up” to keep the power output the same. As you’re doing this, also observe the output of U10 (the gray fiber optic transmitter on the SCTL). At about 75-80Vac it should drop out. Return power to 110Vac.

6.2.4 With your Fluke 87 meter, measure between ACOM (TP21) and P15 (TP22). P15 is unregulated, so it should read between 14 and 20Vdc. Measure also between ACOM and P5 (TP23). It is regulated and should read 5Vdc +/- 5%.

6.2.5 Set scope back to standard mode and disconnect it from the load banks: Vertical Mode to CH1, CH1 to DC, 5Vdc/div, probe connected to P5 (TP23) and set to X1, and common connected to ACOM **(MAKE SURE SCOPE IS ISOLATED!! CHECK THIS BY TAKING YOUR METER AND READING AC VOLTAGE BETWEEN THE THIRD LEG [EARTH GROUND] OF ANY OF YOUR 110Vac OUTLETS AND COMMON ON THE SCOPE. IT SHOULDN’T BE ZERO VOLTS. NEXT CHECK CONTINUITY, IT SHOULD READ INFINITY OR VERY HIGH RESISTANCE)** If the scope isn’t isolated, your SCTL, your GDPA, and possibly your o-scope can create a **very** interesting light show. Observe a clean 5Vdc on TP23. Now move the scope lead to pin 14 of U4. Notice the output is constantly changing as unit tries to regulate output current (with fiber optic turned on). Move the scope lead to TP7. It should be the inverse of U4 pin 14 Leave the scope leads here for the next step.

6.2.6 Observing TP7, apply a short to either one of the load banks. You should observe multiple “shark tooth” spikes appear where there was just noise before. Shorting both banks at the same time should make twice as many of these spikes appear.

6.2.7 With scope still connected as before, power down the entire assy. and unplug the J1 (27KHz) connector on the SCTL. Connect the unused half of your dual power supply to the SCTL card with COM going to ACOM and positive going to P15 (TP22). Set the output to 15Vdc. This means the bench supply will substitute for the 27KHz input (handy for troubleshooting). When the entire assy. is powered up again it should run just fine. Now, still observing TP7 with the scope, vary the power supply output from 15Vdc down to 11Vdc. You should see TP7 go eventually to a solid 5Vdc on the o-scope. It should do this whether the 110Vac is powered up or not. Disconnect the power supply from TP22 and reconnect the 27KHz cable to J1. That's all folks…

6.3 Post Testing Burn-in **Required ___ Yes _X_ No**

Note: DO NOT DO AN OVERNIGHT BURN-IN ON THIS UNIT UNLESS ORDERED TO DO SO. IT IS NOT DESIGNED FOR CONTINUOUS RUNNING. IT IS MEANT TO CHARGE A CAPACITOR BANK JUST BEFORE CLOSING A HIGH POWER CONTACTOR, AND ISN'T USED AFTER THAT. Overnight burn-in will require some serious attention be paid to keeping the unit cool. Just running it too long on the bench has caused previous units to shut down. Running one overnight could cause a safety risk (fire), as well as damaging the unit, possibly beyond repair.

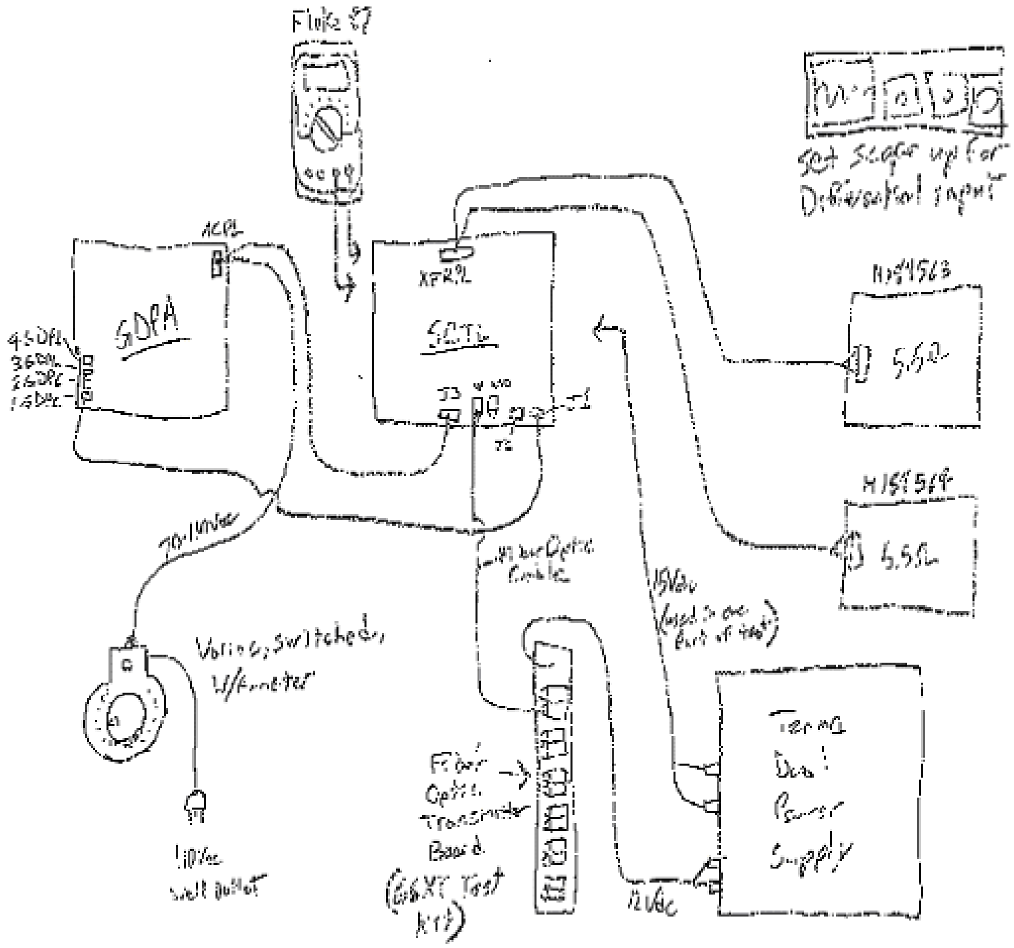
6.4 ***TEST COMPLETE ***

7. NOTES

7.1

8. ATTACHMENTS

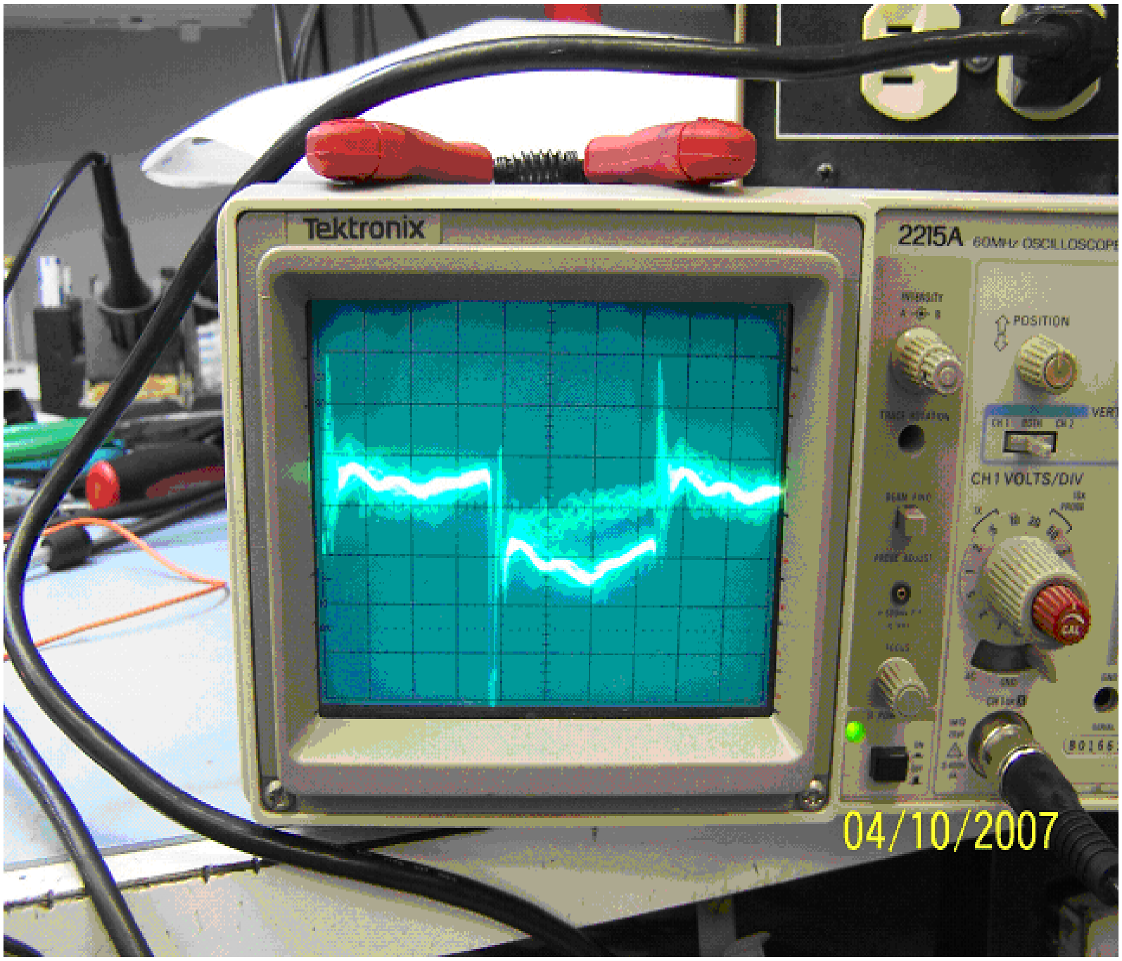
8.1 Hand-drawn diagram of test setup:



IS200SCTL Test Layout

8.2

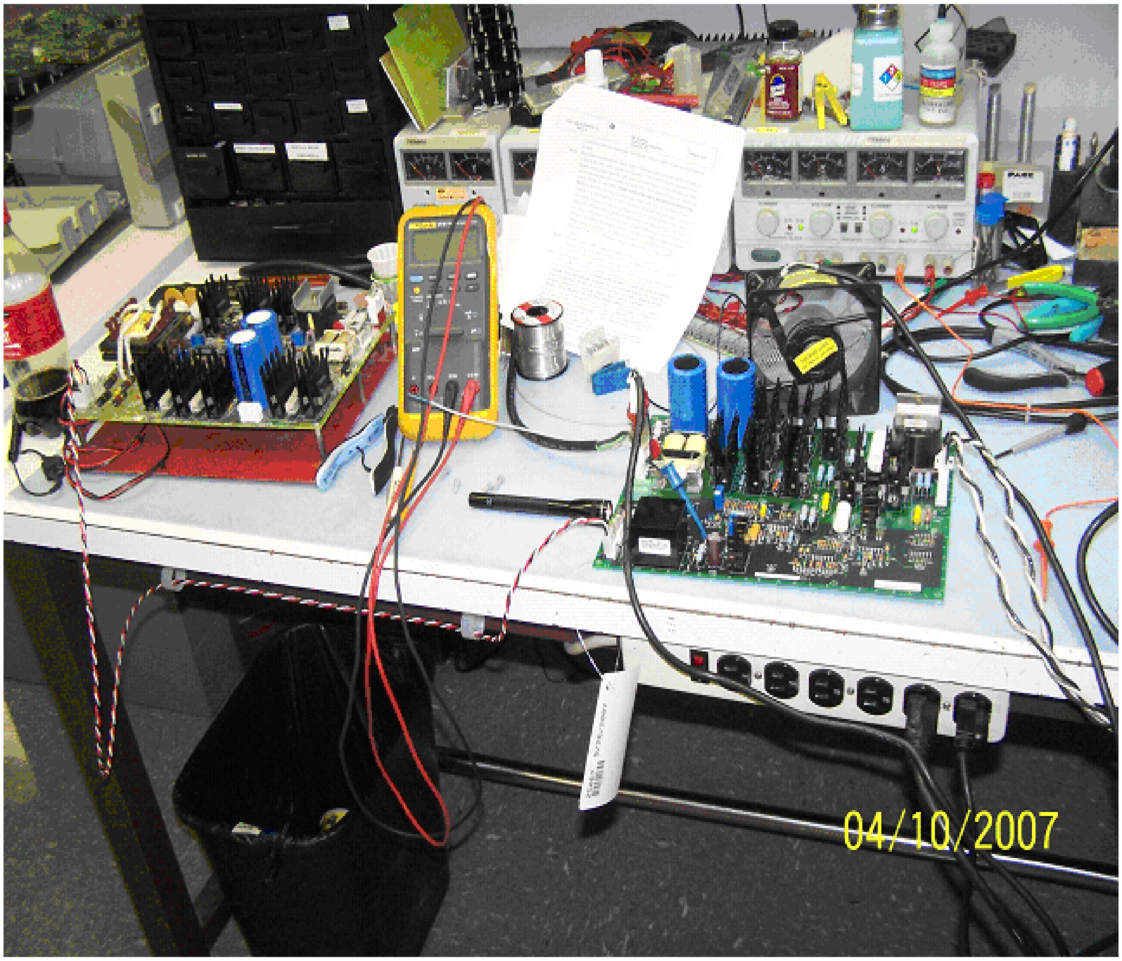
8.3 Scope signal:



8.4 **Load banks:**

8.5 

SCTL unit under test, hooked up to a GDPA: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