g GE Energy	**Functional Testing Specification**
Parts & Repair Services ***Louisville, KY***	**LOU-GED-DS200EXDE**

Test Procedure for a De-Excitation Control Board

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

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	John Madden	7/13/2007
B	Corrected small errors and typos	John Madden	5/6/2008
C	Completed a test fixture H188962	Roger Johnson	12/3/2010

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DATE	**DATE**	**DATE**	**DATE**
May 6, 2008	12/3/2010		5/6/2008

1. SCOPE

1.1 This is a functional testing procedure for a DS200EXDE De-Excitation Control 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 N:\Design Folders\DS\DS200\DS200E\EXDE

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, 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	Reference #	Description
1		Fluke 87 DMM (or Equivalent)
1	H188962	Test box
1		Oscilloscope
1		Tenma Dual DC Power Supply
1	H188505	Fluke 5500A Calibrator

6. TESTING PROCESS

6.1 Setup

6.1.1 Connect +24VDC (ORANGE) –24VDC(YELLOW) and ground(BLACK) to the tester. Connect all cables and connectors of test fixture to UUT. Now, on the DC Power Supply, select "Series", set its output to +/- 24V (48Vdc total).

6.1.2 All jumpers in default setting. See screen-printing on board, or schematic drawings for reference.

✍ **Note: This board's sole function in life is to crowbar (shut down) the field of a generator upon receiving a TTL shutdown command or observing an over-voltage condition in the field by firing an SCR that shunts the field voltage to ground. This test is designed to verify the board's ability to do just that, on the bench. This board is split into two halves, so each step is either done simultaneously to both sides, or is repeated between them.**

6.2 Testing Procedure

6.2.1 **Initial power up:** Turn power supply on. Turn on POWER A switch you should observe POWER A led, SENSOR A led and three green LED's (CR43, CR44 and CR47) on the UUT will light up. Take voltage readings at the following Test Points: Using COMA (2TB-2, EPL1-8, EPL2-8, EPL1-9, EPL2-9) or COMB (5TB-2, EPL1-30, EPL2-30, EPL1-31, EPL2-31 as common (the two should be tied together through the tester, read outputs at P5A, P12A (JCX-1 and JCX-6), P24A (2TB-3, EPL1-4, EPL2-4, EPL1-5, EPL2-5) and N24A (2TB-1, EPL1-6, EPL2-6, EPL1-7, EPL2-7. Turn on POWER B switch you should observe POWER B led, SENSOR B led and three green LED's (CR45, CR46 and CR48) on the UUT will light up. Take voltage readings at the following Test Points: Using COMA (2TB-2, EPL1-8, EPL2-8, EPL1-9, EPL2-9) or COMB (5TB-2, EPL1-30, EPL2-30, EPL1-31, EPL2-31) as common (the two should be tied together through the tester, read outputs at P5B, P12B (JCY-1 and JCY-6), P24B (5TB-3, EPL1-26, EPL2-26, EPL1-27, EPL2-27) & N24B (5TB-1, EPL1-28, EPL2-28, EPL1-29, EPL2-29).The 5V & 12V outputs are generated on the card itself, so they need to be verified in this manner.

6.2.2 **Conduction Sensor input A:** Switch the conduction switch to the right, the SENSOR A led should turn off and on the UUT CR42 should turn on.

6.2.3 **Conduction Sensor input B:** Switch the conduction switch to the left, the SENSOR B led should turn off and on the UUT CR27 should turn on.

6.2.4 **Firing control signals:** Switch the FIRING switch to the right to turn on SCR FIRING A, the led should come on. Connect an Oscilloscope to MP1 (EPL1-1, EPL2-1) and power

supply ground SET on DC coupling**.** Verify a 1.3KHZ +/-1% pulse wave (10us pulse), 3.90 Vpk-pk with zero volt reference. Next connect the Oscilloscope to the isolated DEPL output, both the probe and Oscilloscope ground must be connect across the DEPL output. Verify a 1.3KHZ +/-1% pulse wave (10us pulse), 16 Vpk-pk with zero volt reference. Switch the FIRING switch to the left to turn on SCR FIRING B the led should come on. Connect an Oscilloscope to MP2 (EPL1-23, EPL2-23) and power supply ground SET on DC coupling**.** Verify a 1.3KHZ +/-1% pulse wave (10us pulse), 3.90 Vpk-pk with zero volt reference. Next connect the Oscilloscope to the isolated DEPL output, both the probe and Oscilloscope ground must be connect across the DEPL output. Verify a 1.3KHZ +/-1% pulse wave (10us pulse), 16 Vpk-pk with zero volt reference.

6.2.5 High voltage break-over diodes: There are five diodes with resistor networks attached to them that are set up in such a way as to sense the anode-cathode voltage of the particular SCR that this card is responsible for. When they are jumpered correctly, their break-over (avalanche) voltages add up to a given setting that will trigger the card to fire the SCR if the anode-cathode voltage creeps above the particular setting. The diodes on this card are made to break-over individually at 700 volts. To test them, use the Fluke 5500A Calibrator to apply a forward-biased DC voltage to each diode and observe the breakdown point. To do this, power up the calibrator. Connect the “Normal” output jacks according to the table below (red jack HI to E11, black jack LO to E12), punch in 650, then V for volts, and hit Enter. Nothing should happen yet, until you hit OPR for Operate. The calibrator will then apply 650Vdc across the diode, but since the diode should not be conducting yet, nothing will happen. Use the left arrow key just above the thumbwheel on the calibrator to move the underline cursor to the tens place on the readout. Use the thumbwheel to increment the voltage upward, first to 660V, then on to 700V. Still nothing should happen. Incrementing one more time to 710V should cause the calibrator to go into overload and shut down. **(This was the case on the first few boards tested. Eventually, after several diodes had failed either high or low on the voltage required to cause breakover, they were replaced with new. The new diodes typically breakover between 680 and 700Vdc. I would not fail an OEM diode if it breaks over in this range, having now seen where the new ones are breaking over.)** This tells you that the break-over voltage was exceeded and the diode “avalanched” like it was supposed to. These diodes are made to latch and will conduct once they break-over until voltage is removed from them. Since the calibrator is set to

shut down with very little current overload, this makes it ideal to test these diodes in-circuit.

6.2.6 Below are the points you need to check in this manner to verify all five of these diodes are good:

Diode	LO (black jack)	HI (red jack)
CR32	E12	E11
CR31	E11	E10
CR30	E10	E9
CR29	E9	E8
CR28	E8	E7A or B

6.2.7 **Resistor network checks:** Remove the calibrator since you are done with it. Use your meter to check resistance across the following points:

Point	Point	Resistance
E13	E12	100 Ohm
E12	E11	49.8K Ohm
E11	E10	49.8K Ohm
E10	E9	49.8K Ohm
E9	E8	49.8K Ohm
E8	E7A or B	49.8K Ohm
E7A or B	E6	19.5M to 22M Ohm (check in both polarities, this one is across a diode junction)
E6	E5	33.2 Ohm
E5	E4	33.2 Ohm
E4	E3	33.2 Ohm
E3	E2	33.2 Ohm
E2	E1A, B, or C	33.2 Ohm

***6.3 NOTE BEFORE UNIT IS REMOVE FROM TESTER ALLOW THE CAPACITORS TO DISCHARGE (*Capacitor discharge time after power off is 1-2 minutes).**

6.4 ***TEST COMPLETE ***

7. NOTES

7.1 None at this time.

8. ATTACHMENTS

8.1 None at this time.