ABB *Parts & Repair Services* *Louisville, KY*	**Functional Testing Specification** **LOU-GED-IS200TSVAH1A**

Test Procedure for a

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PREPARED BY	REVIEWED BY	REVIEWED BY	QUALITY APPROVAL
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DATE 5/13/2019	**DATE**	**DATE**	**DATE** 5/13/2019

1. SCOPE

1.1 This is a functional testing procedure for a 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 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, 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		Tenma Dual output supply
1		Dual Channel O-scope
1		Frequency Generator

6. TESTING PROCEDURE

6.1 Resistance Checks

6.1.1 Using an ohm meter, verify continuity between pin 1 of JR6, JS6, and JT6.

6.1.1.1 Repeat this step for pins 3, 8, and 13 of the same connectors.

6.1.2 Connect one lead to JR6 pin 1 (SV1TMRAH) and the other to TB2 pin 25 (RSV1C) which should read approx. 100 ohms.

6.1.2.1 Repeat this step for the remaining pins using ***Table 1***, listed below.

Meter +	***Meter -***	***Output***
(SV1TMRAH) JR6 pin 1	(RSV1C) TB2 pin 25	100 Ohm
(SV1TMRBH) JR6 pin 3	(RSV1C) TB2 pin 25	25 Ohm
(SV2TMRAH) JR6 pin 13	(RSV2C) TB2 pin 33	100 Ohm
(SV2TMRBH) JR6 pin 8	(RSV2C) TB2 pin 33	25 Ohm

Table 1

6.1.3 Connect one lead of the ohm meter to JR1 pin 31 (RSV1TMROUT) and the other lead to the same TB2 pin 25 (RSV1C) as before. With jumper JP5 connected the meter should read approx. 175 ohms. Using ***Table 2***, listed below, verify output for each jumper setting (JP5 through JP1).

6.1.3.1 Repeat this step for JS1 pin 31 (SSV1TMROUT) and JT1 pin 31 (TSV1TMROUT) using ***Table 2***.

6.1.4 Connect one lead of the ohm meter to JR1 pin 30 (RSV2TMROUT) and the other lead to the same TB2 pin 33 (RSV2C) as before. With jumper JP10 connected the meter should read approx. 175 ohms. Using ***Table 2***, listed below, verify output for each jumper setting (JP10 through JP6).

6.1.4.1 Repeat this step for JS1 pin 30 (SSV2TMROUT) and JT1 pin 30 (TSV2TMROUT) using ***Table 2***.

(JP1 through JP5 for RSV1C) and (JP10 through JP6 for RSV2C)	Output
JP5 or JP10	175 ohm
JP4 or JP9	416 ohm
JP3 or JP8	185 ohm
JP2 or JP7	100 ohm
JP1 or JP6	35 ohm

Table 2

6.1.5 Verify resistance measurements, listed below, in ***Table 3***.

Meter +	Meter -	Output
(PR1H) TB2 pin 43	(PR1L) TB2 pin 44	Above .5M ohm
(PR2H) TB2 pin 47	(PR2L) TB2 pin 48	Above .5M ohm
(PR1RH) JR5 pin 1	(PR1RL) JR5 pin 9	316K ohm
(PR2RH) JR5 pin 8	(PR2RL) JR5 pin 15	316K ohm
(PR1SH) JS5 pin 1	(PR1SL) JS5 pin 9	316K ohm
(PR2SH) JS5 pin 8	(PR2SL) JS5 pin 15	316K ohm
(PR1TH) JT5 pin 1	(PR1TL) JT5 pin 9	316K ohm
(PR2TH) JT5 pin 8	(PR2TL) JT5 pin 15	316K ohm

Table 3

6.2 Power Distribution

When power is applied to this card the IS205WSVA daughter card generates a significant amount of heat. A fan circulating air across the card is needed when power is applied for more than a few minutes.

6.2.1 Connect +28V DC to JR1 pin 1 with COM connected to either JR1 pin 2, 17, or 21. Connect the positive lead of a volt meter to TB2 pin 41 (P24V1) and the negative lead to TB2 pin 42 (PCOM). With power applied verify 24V DC on the volt meter.

6.2.2 Move +28V DC input to JS1 pin1 with COM connected to either JS1 pin 2, 17, or 21. Leaving the volt meter on the same pins (P24V1), verify 24V DC on the meter.

6.2.3 Move +28V DC input to JT1 pin1 with COM connected to either JT1 pin 2, 17, or 21. Leaving the volt meter on the same pins (P24V1), verify 24V DC on the meter.

6.2.4 Move the positive lead of the volt meter to TB2 pin 45 (P24V2) and verify 24V DC on the meter.

6.2.5 Repeat steps ***6.2.1*** and ***6.2.2*** with the meter at TB2 pin 45 (P24V2) and verify 24V DC on the meter.

6.2.6 Power down the UUT and connect all three +28V DC inputs at pin 1 of JR1, JS1, and JT1. Connect COM at either pins 2,17, or 21 of JR1, JS1, and JT1.

6.2.7 Connect -28V DC to pin 20 of JR1, JS1, and JT1 and re-apply power to the UUT at this time.

6.2.7.1 ***When the JR1, JS1, and JT1 circuits are powered on together the current draw is roughly 300mA. Therefore, current limits on the power supply may need to be adjusted and the, previously mentioned, fan will definitely be needed as long as power is applied.***

6.3 Pulse Rate Circuit

6.3.1 Using a function generator, connect a 10KHz square wave at 1Vp-p to channel 1 of O-scope. Also connect function generator positive lead to TB2 pin 43 (PR1H) and the negative lead to TB2 pin 44 (PR1L).

6.3.2 Connect the positive lead of O-scope channel 2 to JR5 pin 1 (PR1RH) and the negative lead of channel 2 to JR5 pin 9 (PR1RL).

6.3.2.1 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.3.3 Increase the frequency from the function generator to 100KHz and verify that the frequency matches on the scope but the amplitude is roughly half on the output.

6.3.4 Return the frequency to 10KHz on the function generator and verify that both channels match on the O-scope once again.

6.3.5 Move positive lead of the input to TB2 pin 39 (TTL1) and repeat steps ***6.3.1*** through ***6.3.4***.

6.3.6 Return positive lead of the input to TB2 pin 43 (PR1H). Move the positive lead of O-scope channel 2 to JS5 pin 1 (PR1SH) and the negative lead of channel 2 to JS5 pin 9 (PR1SL).

6.3.6.1 repeat steps ***6.3.1*** through ***6.3.4***.

6.3.7 Move the positive lead of O-scope channel 2 to JT5 pin 1 (PR1TH) and the negative lead of channel 2 to JT5 pin 9 (PR1TL).

6.3.7.1 repeat steps ***6.3.1*** through ***6.3.4***.

6.3.8 Move function generator positive lead to TB2 pin 47 (PR2H) and negative lead to TB2 pin 48 (PR2L).

6.3.9 Connect the positive lead of O-scope channel 2 to JR5 pin 8 (PR2RH) and the negative lead of channel 2 to JR5 pin 15 (PR2RL).

6.3.9.1 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.3.10 Increase the frequency from the function generator to 100KHz and verify that the frequency matches on the scope but the amplitude is roughly half on the output.

6.3.11 Return the frequency to 10KHz on the function generator and verify that both channels match on the O-scope once again.

6.3.12 Move positive lead of the input to TB2 pin 40 (TTL2) and repeat steps ***6.3.8*** through ***6.3.11***.

6.3.13 Return positive lead of the input to TB2 pin 47 (PR2H). Move the positive lead of O-scope channel 2 to JS5 pin 8 (PR2SH) and the negative lead of channel 2 to JS5 pin 15 (PR2SL).

6.3.13.1 repeat steps ***6.3.8*** through ***6.3.11***.

6.3.14 Move the positive lead of O-scope channel 2 to JT5 pin 8 (PR2TH) and the negative lead of channel 2 to JT5 pin 15 (PR2TL).

6.3.14.1 repeat steps ***6.3.8*** through ***6.3.11***.

6.4 LVDT circuit

6.4.1 LVDT1

6.4.1.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to TB1 pin 1 (LV1H) and the negative lead to TB1 pin 2 (LV1L).

6.4.1.2 Connect the positive lead of O-scope channel 2 to JR1 pin 5 (RSTLV1H) and the negative lead to JR1 pin 6 (RSTLV1L).

6.4.1.3 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.4.1.4 Repeat steps ***6.4.1.1*** through ***6.4.1.3*** with the positive lead of channel 2 at JS1 pin 5 (SSTLV1H) and the negative lead at JS1 pin 6 (SSTLV1L).

6.4.1.5 Repeat steps ***6.4.1.1*** through ***6.4.1.3*** with the positive lead of channel 2 at JT1 pin 5 (TSTLV1H) and the negative lead at JT1 pin 6 (TSTLV1L).

6.4.2 LVDT2

6.4.2.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to TB1 pin 3 (LV2H) and the negative lead to TB1 pin 4 (LV2L).

6.4.2.2 Connect the positive lead of O-scope channel 2 to JR1 pin 7 (RSTLV2H) and the negative lead to JR1 pin 8 (RSTLV2L).

6.4.2.3 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.4.2.4 Repeat steps ***6.4.2.1*** through ***6.4.2.3*** with the positive lead of channel 2 at JS1 pin 7 (SSTLV2H) and the negative lead at JS1 pin 8 (SSTLV2L).

6.4.2.5 Repeat steps ***6.4.2.1*** through ***6.4.2.3*** with the positive lead of channel 2 at JT1 pin 7 (TSTLV2H) and the negative lead at JT1 pin 8 (TSTLV2L).

6.4.3 LVDT3

6.4.3.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to TB1 pin 5 (LV3H) and the negative lead to TB1 pin 6 (LV3L).

6.4.3.2 Connect the positive lead of O-scope channel 2 to JR1 pin 9 (RSTLV3H) and the negative lead to JR1 pin 10 (RSTLV3L).

6.4.3.3 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.4.3.4 Repeat steps ***6.4.3.1*** through ***6.4.3.3*** with the positive lead of channel 2 at JS1 pin 9 (SSTLV3H) and the negative lead at JS1 pin 10 (SSTLV3L).

6.4.3.5 Repeat steps ***6.4.3.1*** through ***6.4.3.3*** with the positive lead of channel 2 at JT1 pin 9 (TSTLV3H) and the negative lead at JT1 pin 10 (TSTLV3L).

6.4.4 LVDT4

6.4.4.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to TB1 pin 7 (LV4H) and the negative lead to TB1 pin 8 (LV4L).

6.4.4.2 Connect the positive lead of O-scope channel 2 to JR1 pin 11 (RSTLV4H) and the negative lead to JR1 pin 12 (RSTLV4L).

6.4.4.3 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.4.4.4 Repeat steps ***6.4.4.1*** through ***6.4.4.3*** with the positive lead of channel 2 at JS1 pin 11 (SSTLV4H) and the negative lead at JS1 pin 12 (SSTLV4L).

6.4.4.5 Repeat steps ***6.4.4.1*** through ***6.4.4.3*** with the positive lead of channel 2 at JT1 pin 11 (TSTLV4H) and the negative lead at JT1 pin 12 (TSTLV4L).

6.4.5 LVDT6

6.4.5.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to TB1 pin 11 (LV6H) and the negative lead to TB1 pin 12 (LV6L).

6.4.5.2 Connect the positive lead of O-scope channel 2 to JR1 pin 26 (RSTLV6H) and the negative lead to JR1 pin 27 (RSTLV6L).

6.4.5.3 Verify that both channel 1 and channel 2 of O-scope have matching waveforms.

6.4.5.4 Repeat steps ***6.4.5.1*** through ***6.4.5.3*** with the positive lead of channel 2 at JS1 pin 26 (SSTLV6H) and the negative lead at JS1 pin 27 (SSTLV6L).

6.4.5.5 Repeat steps ***6.4.5.1*** through ***6.4.5.3*** with the positive lead of channel 2 at JT1 pin 26 (TSTLV6H) and the negative lead at JT1 pin 27 (TSTLV6L).

6.4.5.5.1 ***NOTE:*** ***LVDT5 does not have an input connected on the card, however, there is an LVDT5 output which will be covered in the excitation circuit test below.***

6.5 LVDT Excitation Circuit

6.5.1 ER1

6.5.1.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to JR1 pin 3 (ER1H) and the negative lead to JR1 pin 4 (ER1L).

6.5.1.2 Connect the positive lead of O-scope channel 2 to TB1 pin 17 (ERH1) and the negative lead to TB1 pin 18 (ERL1).

6.5.1.3 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.1.4 Using an ohm meter, connect the positive lead to P12 pin 3 (RLY1STAT) and connect the negative lead to PCOM. Verify approx. 1 ohm (closed) on the meter.

6.5.1.5 Move the positive lead of o-scope channel 2 to TB1 pin 13 (EDRH1) and the negative lead to TB1 pin 14 (EDRL1). The waveform on channel 2 should disappear, with the exception of a little noise.

6.5.1.6 Connect two of either JR1 pin 29, JS1 pin 29, or JT1 pin 29 to PCOM. For the remainder of this test these connections will be referred to as JRST1. With JRST1 pin 29 (EXT1VOTE) tied to PCOM you should hear the relay energize and the ohm meter should switch to above 1M ohm (open).

6.5.1.7 Verify that both channel 1 and channel 2 of O-scope have returned to inverted but, otherwise, matching waveforms.

6.5.2 LVDT5

6.5.2.1 Using all other connections from ER1 testing, move the positive lead of o-scope channel 2 to JR1 pin 24 (RSTLV5H) and the negative lead to JR1 pin 25 (RSTLV5L).

6.5.2.2 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.2.3 Repeat steps ***6.5.2.1*** and ***6.5.2.2*** with the positive lead of channel 2 at JS1 pin 24 (SSTLV5H) and the negative lead at JS1 pin 25 (SSTLV5L).

6.5.2.4 Repeat steps ***6.5.2.1*** and ***6.5.2.2*** with the positive lead of channel 2 at JT1 pin 24 (TSTLV4H) and the negative lead at JS1 pin 25 (TSTLV5L).

6.5.3 ES1

6.5.3.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to JS1 pin 3 (ES1H) and the negative lead to JS1 pin 4 (ES1L).

6.5.3.2 Connect the positive lead of O-scope channel 2 to TB1 pin 21 (ESH) and the negative lead to TB1 pin 22 (ESL).

6.5.3.3 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.3.4 Using an ohm meter, connect the positive lead to P12 pin 3 (RLY1STAT) and connect the negative lead to PCOM. Verify approx. 1 ohm (closed) on the meter.

6.5.3.5 Move the positive lead of o-scope channel 2 to TB1 pin 13 (EDRH1) and the negative lead to TB1 pin 14 (EDRL1).

6.5.3.6 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.3.7 Connect two of either JRST1 pin 29 to PCOM. With JRST1 pin 29 (#EXT1VOTE) tied to PCOM you should hear the relay energize and the ohm meter should switch to above 1M ohm (open). The waveform on channel 2 should disappear, with the exception of a little noise.

6.5.4 ER2

6.5.4.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to JR1 pin 22 (ER2H) and the negative lead to JR1 pin 23 (ER2L).

6.5.4.2 Connect the positive lead of O-scope channel 2 to TB1 pin 19 (ERH2) and the negative lead to TB1 pin 20 (ERL2).

6.5.4.3 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.4.4 Using an ohm meter, connect the positive lead to P12 pin 4 (RLY2STAT) and connect the negative lead to PCOM. Verify approx. 1 ohm (closed) on the meter.

6.5.4.5 Move the positive lead of o-scope channel 2 to TB1 pin 15 (EDRH2) and the negative lead to TB1 pin 16 (EDRL2). The waveform on channel 2 should disappear, with the exception of a little noise.

6.5.4.6 Connect two of either JRST1 pin 28. With JRST1 pin 28 (EXT2VOTE) tied to PCOM you should hear the relay energize and the ohm meter should switch to above 1M ohm (open).

6.5.4.7 Verify that both channel 1 and channel 2 of O-scope have returned to inverted but, otherwise, matching waveforms.

6.5.5 ET1

6.5.5.1 Connect a 3.2KHz sine wave at 1Vp-p from the function generator to channel 1 of the O-scope. Also connect the positive lead of the function generator to JT1 pin 3 (ET1H) and the negative lead to JT1 pin 4 (ET1L).

6.5.5.2 Connect the positive lead of O-scope channel 2 to TB1 pin 23 (ETH1) and the negative lead to TB1 pin 24 (ETL1).

6.5.5.3 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.5.4 Using an ohm meter, connect the positive lead to P12 pin 4 (RLY2STAT) and connect the negative lead to PCOM. Verify approx. 1 ohm (closed) on the meter.

6.5.5.5 Move the positive lead of o-scope channel 2 to TB1 pin 15 (EDRH2) and the negative lead to TB1 pin 16 (EDRL2).

6.5.5.6 Verify that both channel 1 and channel 2 of O-scope have inverted but, otherwise, matching waveforms.

6.5.5.7 Connect two of either JRST1 pin 28. With JRST1 pin 28 (EXT2VOTE) tied to PCOM you should hear the relay energize and the ohm meter should switch to above 1M ohm (open). The waveform on channel 2 should disappear, with the exception of a little noise.

6.6 Board ID checks

6.6.1 There are nine ID chips on this card that need to be verified. The first three are checked at JRST1 positive to JRST1 pin 37 and negative to JRST1 pin 36.

6.6.2 The next three are at JRST5, positive to JRST5 pin 4 and negative to JRST5 pin 5.

6.6.3 The last three are at JRST6, positive to JRST6 pin 4 and negative to JRST6 pin 5.

6.6.4 Post Testing Burn-in Required ___ Yes _*x*__ No

Note: Post testing burn-in is not required unless otherwise noted by customer request.

*6.7 ***TEST COMPLETE ****

7. Notes

7.1 None at this time?

8. Attachments

8.1 None at this time?