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QUALITY REP: <i>Robert Duall</i>		
TITLE: Test Procedure for DS3820LT4A, C, or E Lodtrack		PROCEDURE: LOU-GED-DS3820LT4-P

1. INTRODUCTORY DESCRIPTION

- A. This procedure establishes the methods for testing a DS3820LT4A, C, or E.
- B. Environmental ranges: 70 +/- 10 Deg. F. with 20-75% R.H.
- C. Unit warm-up/stabilization period requirement: None
- D. Personnel using this procedure are expected to have a high degree of confidence and expertise in related testing and calibration procedures.
- E. Procedures not explained here are to be understood as common practice.

2. TEST EQUIPMENT VERIFICATION

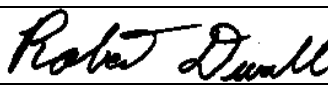
- A. Verify the accuracy of the standard(s) used in the repair/calibration process by evidence of recent calibration labeling affixed to the test equipment.
- B. All measurement standards used in this procedure shall be traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY (N.I.S.T.) and shall have the accuracy, stability, range and resolution required for the intended use.
- C. Unless otherwise specified, the collective uncertainty of the Measurement Standard(s) shall not exceed twenty five percent of the acceptable tolerance for each characteristic being calibrated.
- D. All deviations shall be documented.

3. EQUIPMENT CLEANING

- A. All equipment clean will be performed as instructed in the GE Renewal Services SOP Sec. 14.0

4. EQUIPMENT INSPECTION

- A. The following criteria should be used as a guideline or basis for the inspection process of the this unit:
 - 1. Wires broken or cracked.
 - 2. Terminal strips / connectors broken or cracked.
 - 3. Loose wires.
 - 4. Components visually damaged.
 - 5. Capacitors leaking.
 - 6. Solder joint, cold or otherwise inadequate.
 - 7. Circuit board discolored or burned.
 - 8. Printed wire runs burned or damaged.

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5. REVISION HISTORY

Revision	Date	By	Reason for Revision
A	29-Jun-88	D. Wetzel	Initial Procedure – After Verification
B	11-JUL-88	J. Pentecost	Added PT to CT phase sequence test
C	11-JUL-88	J. Pentecost	Made changes to PT test for PLL software.
D	19-JUL-88	J. Pentecost	Added self-test failure codes.
E	25-JUL-88	Don Wetzel	Changed s/w revision and offset update print out.
F	1-MAR-89	J. Pentecost	Made changes to PT test to match changes.
G	3-Mar-89	J. Pentecost	Made changes to CT test for reduced of Ground fault CT current.
H	9-Mar-89	J. Pentecost	Updated software version numbers and notes on work arounds.
I	20-Mar-89	J. Pentecost	Corrected test sequence per suggestion from J. Stefanski in last Ground Fault save to EEPROM. Last test step.
J	12-May-98	E. Rouse	Designed a new version test fixture which utilizes a different voltage source which eliminated the need for the A/D divider circuitry and A/D input selector switch
K	08-Aug-98	R. Duvall	Converted document to WORD format
L	14-Jun-00	R. Duvall	Converted to standard procedure format. Added revisions made by techs. Added info about firmware.
M	02-FEB-02	D. SMITH	Added ECN info on DS3800NLTB card and edited text.
N	12-JUN-02	R Duvall	Added E signature and photos.
O	14-Aug-03	J. Madden	Rearranged steps of test L for better clarity, & corrected typos throughout test
P	5/13/2009	J. Harden	Added comment number 8 in section S, final testing.

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6. REFERENCE DOCUMENTATION

- Fixture Material List # ML 505X624
- Fixture Elementary # 278A1398
- Files for each card of the unit.

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8. TEST EQUIPMENT TO BE USED

- LODTRAK IV TEST STATION H033731
- FLUKE 85 DIGITAL MULTI METER (DMM) or equivalent
- GUILDLINE 9721 PRECISION VOLTAGE SOURCE (or equivalent with Range 50 mVdc – 12 Vdc)
- 2 RED AND 2 BLACK BANANA TO BANANA PLUG JUMPERS

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9. FINAL TEST AND OPERATION PROCESS

A. Initial Setup - Unit



NOTE If the DS3800NLTB is a revision 1_1_ or earlier, perform the following modification: Change on the DS3800NLTB board resistor R12 from 68K to 121K and add 4.75K resistor between cathode of CR14 and the cathode of CR5.



Disassemble the unit under test, remove it's three boards. Attach cards to the appropriate connectors of the tester per the connection diagram found on the last page of this document. Connect the Fluke 85 DMM (or equivalent) to the DMM meter jacks of the tester and set it for measuring AC voltage. Set the Guildline voltage source for the 12V RANGE ONLY and put it in standby mode by pressing the STANDBY push button. Connect the output of the Guildline to the VOLTAGE SOURCE input jacks of the tester.

B. Initial Setup - Fixture

LODTRAK POWER - OFF
 TEST BOARD POWER - off (down)
 QCSIG SW - on (up)
 SAVEN SW - off (down)
 EXTIN SW - off (down)
 E-STOP - Pushed In
 LODTRAK POWER ADJUST - full CCW
 DMM SELECT - position 1 (input power).
 CT SELECT - position 1
 PT SELECT - position 1
 OIT TERMINAL - 1200 BAUD, 8 BIT, 1 STOP BIT, NO PARITY, XONXOFF ENABLED, CAPS LOCK ON

C. 80 VAC POWER SUPPLY ADJUST AND CHECK

1. Pull E-STOP button out.
2. Set Fluke 85 DMM for AC volts.
3. Select DMM SELECT position 1 (input power)
4. Adjust LODTRAK POWER ADJUST until the DMM reads between 80 and 82 VAC.
5. Move LODTRAK POWER switch to ON position.
6. Verify that the DMM still reads between 80 and 82 VAC. If not, adjust LODTRAK POWER ADJUST until it does.
7. Select DMM SELECT position 2 (P5).
8. Change the DMM to DC volts.
9. Adjust R1 on the NLTB for 5.00 +/- 0.05 VDC (4.95 - 5.05) on the DMM.10. Select DMM SELECT position 3 (P15), DMM should read 15.00 +/-1.0 VDC.
11. Select DMM SELECT position 4 (N15), DMM should read -15.00 +/-1.0 VDC.
12. Select DMM SELECT position 5 (OVIMOK), DMM should read between 1.5 and 3.0 VDC.
13. Move LODTRAK POWER switch to OFF position.

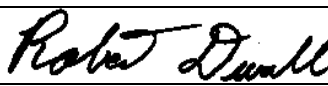
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D. 132 VAC POWER SUPPLY CHECK

1. Change the DMM to AC volts.
2. Select DMM SELECT position 1 (input power)
3. Adjust LODTRAK POWER ADJUST until the DMM reads between 130 and 132 VAC.
4. Move LODTRAK POWER switch to ON position.
5. Verify that the DMM still reads between 130 and 132 VAC. If not, adjust LODTRAK POWER ADJUST until it does.
6. Select DMM SELECT position 2 (P5).
7. Change the DMM to DC volts.
8. DMM should read 5.00 +/- 0.10 VDC.
9. Change the DMM to MV scale, AC volts, DMM should read less than 50 mVAC.
10. Select DMM SELECT position 3 (P15), DMM should read less than 50 mVAC.
11. Change the DMM to DC volts, DMM should read 15.00 +/- 1.0 VDC.
12. Select DMM SELECT position 4 (N15), DMM should read -15.00 +/-1.0 VDC.
13. Change the DMM to MV scale, AC volts, DMM should read less than 50 mVAC.
14. Select DMM SELECT position 5 (0VIMOK).
15. Change the DMM to DC volts, DMM should read between 1.5 and 3.0 VDC.
16. Move LODTRAK POWER switch to OFF position.

E. 115 VAC POWER SUPPLY CHECK

1. Change the DMM to AC volts.
2. Select DMM SELECT position 1 (input power)
3. Adjust LODTRAK POWER ADJUST until the DMM reads 115 +/- 5 VAC.
4. Move LODTRAK POWER switch to ON position.
5. Select DMM SELECT position 2 (P5).
6. Change the DMM to DC volts.
7. DMM should read 5.00 +/- 0.1 VDC.
8. Select DMM SELECT position 3 (P15), DMM should read 15.00 +/-1.0 VDC.
9. Select DMM SELECT position 4 (N15), DMM should read -15.00 +/-1.0 VDC.
10. Select DMM SELECT position 5 (0VIMOK), DMM should read between 1.5 and 3.0 VDC.
11. Move LODTRAK POWER switch to OFF position.

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F. SELF TEST AND EEPROM VERIFICATION

1. Tester setup:
QCSIG SW - on (up)
TEST BOARD POWER - on (up)
2. Move LODTRAK POWER switch to ON position.
3. Verify that the IMOK LED "YELLOW LED" on the MODULE is on solid and not blinking. This indicates that the MODULE self test passed. See below for self-test failure meanings.
Self Test Error Codes are a series of 1 to 8 flashes and a pause that appear on the IMOK LED when a fatal fault prevents error messages from reaching the LCD.
 1. BAD CPU STACK
 2. BAD RAM TEST
 3. BAD ROM TEST
 4. LCA FAIL
 5. HEAP FULL (Software error.)
 6. STACK OVERFLOW (Software error.)
 7. CPU STACK FAULT (Software error.)
 8. C51 STACK FAULT (Software error.)
4. Verify that the terminal has the Lodtrak IV prompt shown below: Lodtrak IV (You may have to press RETURN several times)
5. Enter "EE<cr>" from the terminal (<cr> is return). The screen should read: PASSWORD: (Make sure CAPS LOCK is ON!)
6. Enter "QUEST<cr>" from the terminal. NOTE: The password will not appear on the screen when you enter it. The screen should read: QC TEST MODE >
7. Enter "EG<cr>" from the terminal to move QC variables to NOVDRAM. The screen should read: QC TEST SETUP LOADED QC>
8. Enter "EH<cr>" from the terminal to move NOVDRAM to EEPROM. The screen should read: SAVE TO EEPROM [Y/N]?
9. Enter "Y<cr>" from the terminal. The screen should read: SAVE OK QC>
10. Move LODTRAK POWER switch to OFF position. (Note: Power to the LT4 module must be cycled after saving the QC TEST SETUP in order for the QC software to function properly.)
11. Wait about 1 minute before going on.
12. Move LODTRAK POWER switch to ON position. The screen should read: Lodtrak IV QC>
(You may have to press RETURN several times and only get the QC> part with garbage letters above) This indicates that the QC variables are still in the EEPROM.
13. Enter "EE<cr>" from the terminal. The screen should read: PASSWORD:
14. Enter "QUEST<cr>" from the terminal. The screen should read: QC TEST MODE QC>

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G. LCD DISPLAY TEST



NOTE: *If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions*



Try also "EV" test at this time. Section P

1. Enter "EL<cr>" from the terminal to blank the module display.
2. Verify that the module display is blank.
3. Enter "EJ<cr>" from the terminal to turn on the module top row display elements
4. Verify that all of the pixels in the top row of the module display are on (dark) and the bottom row off. Each character is made up of a 5 by 7 dot matrix and an underline.
5. Enter "EK<cr>" from the terminal to turn on the module bottom row display elements.
6. Verify that all of the pixels in the bottom row of the module display are on (dark) and the top row off.
7. Enter "EL<cr>" from the terminal to blank the module display.

H. SOFTWARE VERSION VERIFICATION



NOTE: *If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions*



The HCPC board should have a DS3815 number on it to indicate which prom set it should have in it. Verify your HCPC has the correct prom set installed in it by checking the material list at the end of this procedure

1. Enter "EP<cr>" from the terminal to display the module software version. The screen should read something like:

V123456 (U4)
V654321 (U5)
QC>

These are version numbers for the software contained in U4 and u5 of the prom set on the HCPC board. Different prom sets will contain corresponding version numbers. Check the table in the back of this procedure to verify your version numbers match the correct prom set number. Please add any new combinations to the table that you may see while testing different modules

I. TRIP LED TEST



NOTE: *If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions*



1. Verify that the module TRIP LED is NOT on.
5. Enter "EV<cr>" from the terminal to toggle the TRIP LED. The screen should read: TRIP LIGHT TEST...
3. Verify that the module TRIP LED is on.
4. Enter "<cr>" from the terminal. Verify that the TRIP LED is off. The screen should read: QC>

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J. SWITCH TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. Enter "EQ<cr>" from the terminal. "KEY DISPLAY MODE..." should be printed out on the screen. The module display should read: KEY = NONE this display indicates that all of the module switches are open.
2. Push the module DEC switch. The module display should read KEY = D. If more than 1 letter appears after "KEY =", more than one switch is being read active. Release the module DEC switch. The display should read KEY = NONE.
3. Push the module INC switch. The display should read KEY = I. Release the module INC switch. The display should read KEY = NONE.
4. Push the module ENTER switch. The display should read KEY = E. Release the module ENTER switch. The display should read KEY = NONE.
5. Push the module RESET switch. The display should read KEY = R. Release the module RESET switch. The display should read KEY = NONE.
6. Push the module FUNCTION switch. The display should read KEY = F. Release the module FUNCTION switch. The display should read KEY = NONE.
7. Enter "<cr>" from the terminal to exit the key display mode.

K. A/D TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions


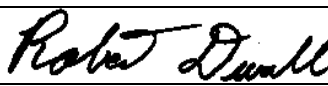


1. Set DMM selector switch on position 6 to monitor the voltage source jacks of the tester with the Fluke DMM.
3. Disconnect the Guildline from the voltage source jacks of the tester and place a short across the jacks.
3. Change the DMM to DC mV.
4. The DMM should read 0 +/- 10 mVDC.5. Enter "PW<cr>" from the terminal. The screen should read: SCAN
MODIFIED >
6. Select DMM SELECT position 9 (to look at XVADC output of NLTA card).
7. The DMM should read 0 +/- 10 mVDC. If not, the multiplexer on the Lodtrak IV NLTA might be bad.
8. Enter "RW<cr>" from the terminal. The displayed value should be between FFF6 and 001F (two's complement hex).
9. Remove the short across the volt source jacks of the tester and reconnect the voltage source.
10. Press the OPERATE push button on the voltage source and set it to output 95.2 mVdc as also seen on the DMM.
11. Enter "<cr>" from the terminal. The displayed value should be between 0100 and 017F (on the terminal)
12. Set the voltage source to output 173.4 mVdc as seen on the DMM.
13. Enter "<cr>" from the terminal. The displayed value should be between 0200 and 027F.
14. Set the voltage source to output 329.7 mVdc as seen on the DMM.
15. Enter "<cr>" from the terminal. The displayed value should be between 0400 and 047F.
16. Change the DMM to DC volts
17. Set the voltage source to output .642 Vdc as seen on the DMM.

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18. Enter "<cr>" from the terminal. The displayed value should be between 0800 and 087F.
19. Set the voltage source to output 1.267 Vdc as seen on the DMM.
21. Enter "<cr>" from the terminal. The displayed value should be between 1000 and 107F.
22. Set the voltage source to output 2.517 Vdc as seen on the DMM.
23. Enter "<cr>" from the terminal. The displayed value should be between 2000 and 207F.
24. Set the voltage source to output 5.02 Vdc as seen on the DMM.
25. Enter "<cr>" from the terminal. The displayed value should be between 4000 and 407F.
26. Set the voltage source to output 10.02 Vdc as seen on the DMM.
27. Reverse the polarity of the wires from the voltage source to output negative voltage.
28. Enter "<cr>" from the terminal. The displayed value should be between 8000 and 807F.
29. Reverse the polarity of the wires from the voltage source again to go back to a positive output voltage
30. Put voltage source in Standby mode.
6. Enter "PX<cr>" from the terminal. The screen should read: *SCAN MODIFIED >*

Voltage	Hex code
95.2mV	0100H-017FH
173.4mV	0200H-027FH
329.7mV	0400H-047FH
642mV	0800H-087FH
1.267V	1000H-107FH
2.517V	2000H-207FH
5.02V	4000H-407FH
-10.02V	8000H-807FH

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L. RTD TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. With a DMM, verify a reading of 15 VDC between P2A-1 and the negative side of C11 on the NLTB card.
Adjust R1 on the NLTB card if necessary. Also note that R1 controls the +5 volts as well as the +15 volt supply. Verify both before continuing.
2. Enter "ER<cr>" from the terminal. "RTD CAL MODE..." should be printed on the screen.
3. The module display should read: CAL 0 = X, 148 - 0 = Y ["X" and "Y" will actually be values in the module display.]
4. Adjust NLTA R1 so that "X" = 0 (+/- .05) on the module display top line (CAL 0 = 0)
5. Adjust NLTA R2 so that "Y" = 148 (+/- .1) on the module display bottom line (148 - 0 = 148).
6. Re-adjust NLTA R1 so that "X" = 0 (+/- .05) on the module display top line (CAL 0 = 0)
7. Wait 1 min. and re-verify calibration in steps 4-6.
8. When the RTD's have been calibrated properly, the module display should read: CAL 0 = 0 (+/- .05) 148 - 0 = 148 (+/- .1)
9. Allow unit to sit for one minute before exiting this step to insure that the readings do not drift.
10. Enter "<cr>" from the terminal to exit the RTD calibrate mode.
11. Read the 10 RTD's as follows:

COMMAND	READING	RTD
RH<cr>	-7 to -13 degrees	1
RI<cr>	-7 to -13 degrees	2
RJ<cr>	197 to 203 degrees	3
RK<cr>	197 to 203 degrees	4
RL<cr>	7 to -13 degrees	5
RM<cr>	197 to 203 degrees	6
RN<cr>	7 to -13 degrees	7
RO<cr>	197 to 203 degrees	8
RP<cr>	127 to 133 degrees	9
RQ<cr>	117 to 123 degrees	10



NOTE Check for defective U15, U16 and U17 chips on NLTA board if several RTD readings are out of tolerance. If the calibration drifts excessively, look for ripple on the positive 15 volts. Probable cause is C9 on the NLTB card.



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M. CURRENT TRANSFORMER (CT) TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



NOTE: Do not leave in DMM-7 for extended periods of time. This can result in damage to the test fixture.



- Tester setup:
CT SELECT - 1
DMM SELECT - 7
- Verify that the Current Transformer Ammeter CTM1 on the front panel of the tester reads between 4.00 and 6.00 amps.
- Enter "EW<cr>" from the terminal to zero the ground fault circuit. The screen should read: OFFSETS UPDATED
- Enter "EH<cr>" from the terminal to move NOVRAM to EEPROM. The screen should read: SAVE TO EEPROM [Y/N]?
- Enter "Y<cr>" from the terminal. The screen should read: SAVE OK QC>
- Move LODTRAK POWER switch to OFF position. (Note: Power to the LT4 module must be cycled after saving the QC TEST SETUP in order for the QC software to function properly.)
- Move LODTRAK POWER switch to ON position. The screen should read: Lodtrak IV QC> *This indicates that the QC variables are still in the EEPROM.*
- Enter "EE<cr>" from the terminal. The screen should read: PASSWORD:
- Enter "QUEST<cr>" from the terminal. The screen should read: QC TEST MODE QC>
- Read the 3 leg currents and ground fault current on the terminal screen as follows:

COMMAND	READING	CURRENT
RA<cr>	less than 0.05 amps	Phase A
RB<cr>	less than 0.05 amps	Phase B
RC<cr>	less than 0.05 amps	Phase C
RG<cr>	less than 0.03 amps	Ground flt



NOTE: if the RG command yields around .23 Amps, try repeating steps 3-9 but leave the unit powered down longer.



- Move the CT SELECT switch to position 2 and verify that the AC Ammeter reads between 4.00 and 6.00 amps.
- Read the 3 leg currents and ground fault current on the terminal screen as follows:

COMMAND	READING	CURRENT
RA<cr>	Same as CTM1 Ammeter reading +/- 0.5 amps	Phase A
RB<cr>	less than 0.05 amps	Phase B
RC<cr>	less than 0.05 amps	Phase C
RG<cr>	less than 0.03 amps	Ground flt

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13. Move the CT SELECT switch to position 3 and verify that the AC Ammeter reads between 4.00 and 6.00 amps.
14. Read the 3 leg currents and ground fault current as follows:

COMMAND	READING	CURRENT
RA<cr>	less than 0.05 amps	Phase A
RB<cr>	Same as CTM1 Ammeter reading +/- 0.5 amps	Phase B
RC<cr>	less than 0.05 amps	Phase C
RG<cr>	less than 0.03 amps	Ground flt

15. Move the CT SELECT switch to position 4 and verify that the DMM reads between 4.00 and 6.00 amps.
16. Read the 3 leg currents and ground fault current as follows:

COMMAND	READING	CURRENT
RA<cr>	less than 0.05 amps	Phase A
RB<cr>	less than 0.05 amps	Phase B
RC<cr>	Same as CTM1 Ammeter reading +/- 0.5 amps	Phase C
RG<cr>	less than 0.03 amps	Ground flt

17. Move the CT SELECT switch to position 5 and verify that the AC Ammeter reads between 2.00 and 3.00 amps.
18. Read the 3 leg currents and ground fault current as follows:

COMMAND	READING	CURRENT
RA<cr>	less than 0.05 amps	Phase A
RB<cr>	less than 0.05 amps	Phase B
RC<cr>	less than 0.03 amps	Phase C
RG<cr>	CTM1 Ammeter reading +/- 0.25 amps	Ground flt

19. Move the CT SELECT switch to position 6 and verify that the CTM1 Ammeter reads between 2.00 and 3.00 amps.
20. Enter "PW<cr>" from the terminal. The screen should read:
SCAN MODIFIEDQC>



NOTE: The display scrolls fast. Please read and understand these steps prior to pressing enter. If you miss it the first time, repeat step 21.



21. Enter "EC<cr>" from the terminal to display all of the module readings. The first 3 lines displayed are leg A, B, and C currents. The 7th line is ground fault current.
22. The leg A, B, and C currents (line 1, 2, and 3) should all be the same value, +/- 0.05 amps and the ground fault current (line 7) should be the same as leg A, B, C (line 1, 2, and 3), +/- 0.10 amps.
23. Enter "PX<cr>" from the terminal. The screen should read:
SCAN MODIFIED QC>
24. Move the CT SELECT and DMM switches to position 1 to turn off the CT currents.

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N. POTENTIAL TRANSFORMER (PT) TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. Tester setup:
PT SELECT - 1
DMM SELECT - 8
DMM – AC voltage
2. Verify that the DMM reads between 100 and 130 volts.
3. Read the 3 line voltages as follows:

COMMAND	READING	VOLTAGE
RD<cr>	less than 1.0 volts	Phase A
RE<cr>	25 +/- 5 volts	Phase B
RF<cr>	25 +/- 5 volts	Phase C

4. Move the PT SELECT switch to position 2 and verify that the DMM reads between 100 and 130 VAC.
5. Read the 3 line voltages as follows:

COMMAND	READING	VOLTAGE
RD<cr>	DMM reading +/- 5 VAC	Phase A
RE<cr>	25 +/- 5 volts	Phase B
RF<cr>	Greater than 50 volts	Phase C

6. Move the PT SELECT switch to position 3 and verify that the DMM reads between 100 and 130 VAC.
7. Read the 3 line voltages as follows:

COMMAND	READING	VOLTAGE
RD<cr>	less than 1.0 volts	Phase A
RE<cr>	DMM reading +/- 5 VAC	Phase B
RF<cr>	DMM reading +/- 5 VAC	Phase C

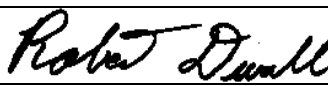
8. Note: PT SELECT Switch position 4 NOT USED.
12. Move the PT SELECT switch to position 5 and verify that the DMM reads between 100 and 130 VAC.



NOTE: The display scrolls fast. Please read and understand these steps prior to pressing enter. If you miss it the first time, repeat step 11.



10. Enter "PW<cr>" from the terminal. The screen should read:
SCAN MODIFIEDQC>
11. Enter "EC<cr>" from the terminal to display all of the module readings. Lines 4, 5, and 6 are line voltage A, B, and C voltages.

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12. The line voltage A and B voltages (line 4 and 5) should be the same value, +/- 2.5 volts, and line voltage C (line 6) should be less than 5.0 volts.
13. Enter "PX<cr>" from the terminal. The screen should read:
SCAN MODIFIEDQC>

O. CT AND PT POLARITY TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. Move the PT SELECT switch to position 5 to turn on all the PT voltages.
2. Select position 7 on the DMM SELECT switch to enable the CT current source.
3. Move the CT SELECT switch to position 6 to send current through all current transformers.
4. Enter "EX<CR>" from the terminal. The screen should read: CT POLARITIES ARE OK! >
If a CT polarity error is detected the terminal should display: CT POLARITY IS WRONG: ERROR # the # will indicate which CT polarity is wrong.

CT Polarity test error code values:

- 1 CT1 Polarity Reversed.
- 2 CT2 Polarity Reversed.
- 4 CT3 Polarity Reversed.
- 8 CT4 Polarity Reversed.

The error code values are additive for multiple failures. For example: 5 would indicate CT1 and CT3 where reversed.

5. Move the CT SELECT switch to position 1 to turn off CT currents.
6. Move the PT SELECT switch to position 1 to turn off PT voltages.
7. Move the DMM SELECT switch to position 1.

P. RELAY TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. Verify that the relay status lights on the module tester are as follows:

TRIP RELAY CONTACTS ---	<P.U. OFF> --	<D.O. ON>
ALARM RELAY CONTACTS --	<P.U. OFF> --	<D.O. ON>
ALT RELAY CONTACTS ----	<P.U. OFF> --	<D.O. ON>

2. Enter "EM<cr>" from the terminal to toggle the TRIP relay. The screen should read: E9H QC>
This indicates that the processor is reading the proper status from the relays. See appendix II for a bit definition of this byte.
3. Verify that the relay status lights on the module tester are as follows:

TRIP RELAY CONTACTS ---	<P.U. ON> --	<D.O. OFF>
-------------------------	--------------	------------

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ALARM RELAY CONTACTS --	<P.U. OFF> --	<D.O. ON>
ALT RELAY CONTACTS ----	<P.U. OFF> --	<D.O. ON>

4. Enter "<cr>" from the terminal to toggle the TRIP relay. The screen should read: E8H QC>
5. Enter "EN<cr>" from the terminal to toggle the ALARM relay. The screen should read: EAHQC>
6. Verify that the relay status lights on the module tester are as follows:

TRIP RELAY CONTACTS ---	<D.O. ON> --	<P.U. OFF>
ALARM RELAY CONTACTS --	<D.O. OFF> -	<P.U. ON>
ALT RELAY CONTACTS ----	<D.O. ON> --	<P.U. OFF>


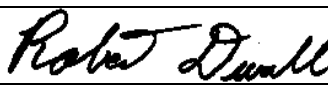
7. Enter "<cr>" from the terminal to toggle the ALARM relay. The screen should read: E8H QC>
8. Enter "EO<cr>" from the terminal to toggle the ALT relay. The screen should read: ECH QC>
9. Verify that the relay status lights on the module tester are as follows:

TRIP RELAY CONTACTS ---	<D.O. ON> --	<P.U. OFF>
ALARM RELAY CONTACTS --	<D.O. ON> --	<P.U. OFF>
ALT RELAY CONTACTS ----	<D.O. OFF> -	<P.U. ON>

10. Enter "<cr>" from the terminal to toggle the ALT relay. The screen should read: E8H QC>
11. Using a DMM, measure the ripple voltage across C11 on the NLTB card.

Check Ripple voltage and voltage drop across C11 (with new caps.). Please detail your steps and they will be added to the next revision.

VRMS Ripple Voltage	VDC across C11	Note
240	14.25	
248	14.1	
270	14.05	

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Q. EXTERNAL INPUT TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. Verify that the SAVEN and EXTIN switches are both off (down) on the tester.
2. Enter "RY<cr>" from the terminal to read the input status. The screen should read: E8H QC>
3. Move the module test SAVEN SW up (on).
4. Enter "<cr>" from the terminal to read the input status. The screen should read: E0H QC>
5. Move the module tester EXTIN SW up (on) and SAVEN SW down (off).
6. Enter "<cr>" from the terminal to read the input status. The screen should read: C8H QC>
7. Move the module tester EXTIN SW down (off).

R. NORMAL MODE AND RS422 TEST



NOTE: If the module has been powered down you will need to power it up and enter the QC TEST MODE with QC variables. See appendix I for instructions



1. Enter "EU<cr>" from the terminal to change to the RS422 communication mode. The screen should read: WAITING FOR QCSIG...
2. Move the module tester QCSIG SW to the OFF (down) position. The screen should read: QC>
3. Enter "EF<cr>" from the terminal to move default variables to NOVRAM. The screen should read: DEFAULT SETUP LOADED >
4. Enter "EH<cr>" from the terminal to move NOVRAM to EEPROM. The screen should read: SAVE TO EEPROM [Y/N]?
5. Enter "Y<cr>" from the terminal. The screen should read: SAVE OK >
6. Verify that the following:
 - CT SELECT switch is in position 1.
 - PT SELECT switch is in position 1.
 - DMM SELECT switch is in position 1.
7. Enter "EW<cr>" from the terminal to zero the ground fault circuit. The screen should read: OFFSETS UPDATED
8. Enter "EH<cr>" from the terminal to move NOVRAM to EEPROM. The screen should read: SAVE TO EEPROM [Y/N]?
9. Enter "Y<cr>" from the terminal. The screen should read: SAVE OK >
10. Move LODTRAK POWER switch to OFF position.
11. Wait about 1 minute before going on.
12. Move QCSIG switch to the ON (UP) position.
13. Move LODTRAK POWER switch to ON position.



NOTE: if the RG command yields an incorrect reading, try repeating steps 6-1 but leave the unit powered down longer.



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IMPORTANT NOTE: QCSIG MUST be on before Lodtrak is powered down.



14. Verify module comes up in normal mode as follows:
 1. >2. Enter "EE<cr>" to enter QC Mode (Password = "QUEST").
 3. Enter "RG<cr>" from the terminal to read ground fault current. The value should be less than 0.03 amps.
15. Prepare the tester for module removal as follows:
 1. LODTRAK POWER - off
 2. E-STOP - Pushed In (Off)
 3. TEST BOARD POWER - off (down)
 4. Voltage Source MODE - STAND BY (all zeros)
 5. DMM SELECT - position 1 (input power).
 7. CT SELECT - position 1
 8. PT SELECT - position 1
 9. SAVEN SW - off (down)
 10. EXTIN SW - off (down)
 11. QCSIG SW - off (down)
16. Remove the module from the tester and re-assemble it into its case.

S. FINAL TESTING

1. Place the re-assembled module on the upper shelf on the side of the tester.
2. Connect a 115 Vac power cord (cheater cord) across pins 11 and 12 of TB1 on the back of the module (make sure you do this first!).
3. Plug the power cord into the power outlet on the side of the tester. Also connect J1 ribbon cable from the tester into the side of the unit
4. Turn the TEST BOARD POWER and QC SIG switches ON. Pull out the E-stop button.
5. Repeat the SWITCH TEST on page 10 of this procedure to verify that the re-assembled unit will at least power up and communicate.
6. Push in the E-stop button and turn OFF the TEST BOARD POWER and QC SIG switches.
7. Disconnect the power cord and J1 ribbon cable to complete this procedure
8. If contrast is too light, place a jumper on TB2-7 & TB2-8. Turn unit back on and decrease contrast. Remove jumper to save.

END OF TEST

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10. SPECIAL INFORMATION

APPENDIX I - QC TEST MODE WITH QC VARIABLES

The following is how the LODTRAK IV is powered up and put into the QC test mode with QC variables:

1. Change the DMM to 200-volt scale, AC volts.
2. Select DMM SELECT position 1 (input power)
3. Adjust LODTRAK POWER ADJUST until the DMM reads 115 +/- 5 VAC.
4. Move QCSIG SW ON position (up).
5. Move Test Board POWER switch to ON position (up).
6. Move LODTRAK POWER switch to ON position.
7. Verify that the terminal has one of the following Lodtrak IV prompts on it: Lodtrak IV > OR -Lodtrak IV QC>
8. Enter "EE<cr>" from the terminal. The following will be printed out: PASSWORD:
9. Enter "QUEST<cr>" from the terminal.
10. One of the following should be printed on the screen: QC TEST MODE >OR -QC TEST MODE QC>
If the first prompt appears, go on to the next step. If the second prompt appears, the module is in the QC TEST MODE with QC variables and you can return to the test step you were on.
11. Enter "EG<cr>" from the terminal to move QC variables to NOVRAM. The following should be printed out: QC TEST SETUP LOADED QC>
12. Enter "EH<cr>" from the terminal to move NOVRAM to EEPROM. The following should be printed on the screen: SAVE TO EEPROM [Y/N]?
13. Enter "Y<cr>" from the terminal. The following should be printed on the screen: SAVE OK QC>
The module is now in the QC test mode with QC variables.

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APPENDIX II - BIT MEANINGS OF STATUS BYTE

The following is the bit definition of the LODTRAK IV status byte:

1. Bit 0 (LSB) - Trip relay status (1 - energized, 0 - not energized)
2. Bit 1 - Alarm relay status (1 - energized, 0 - not energized).
3. Bit 2 - AUX relay status (1 - energized, 0 - not energized).
4. Bit 3 - SAVEN status (1 - not true, 0 - true).
5. Bit 4 - QC SIG status (1 - not true, 0 - true).
6. Bit 5 - EXTIN status (1 - not true, 0 - true).
7. Bit 6 and 7 (MSB) - Tied to 1.

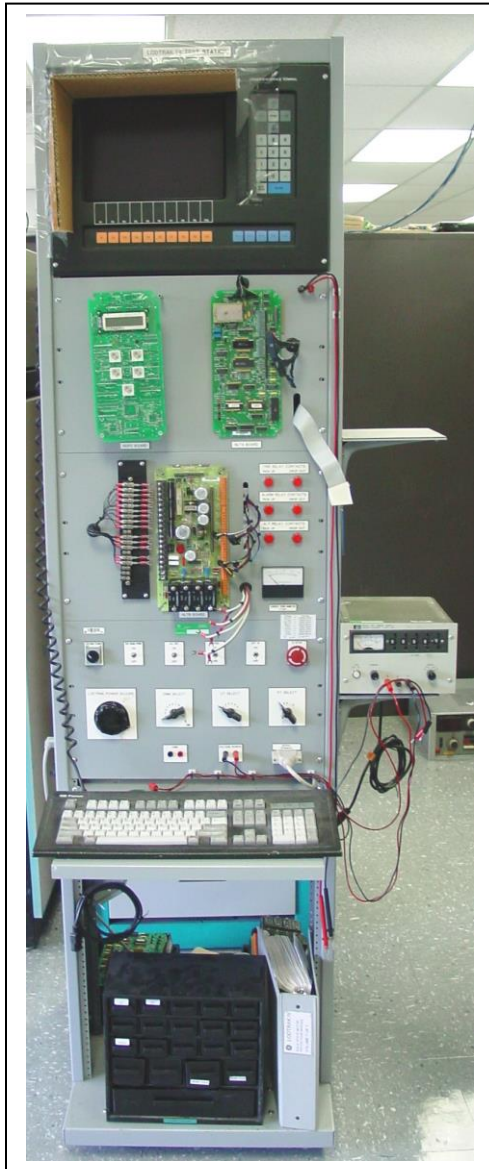
The status byte can be read with the "RY<cr>" command. It is also output after each relay toggle command.

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APPENDIX III - TABLE FOR SOFTWARE VERSIONS
OF THE HCPC BOARD

HCPC BOARD NUMBER	PROM SET NUMBER	U4 SOFT VERSION #	U5 SOFT VERSION #
DS3815HCPE1F1A	PSP3815HCPEXX	V920716	V890308
DS3815HCPA1C1A	PSP3815HCPAXXAA	V900524	V890308
DS3815HCPA1D1A		V920716	V890308
DS3815HCPC1K1G		V920716	V890308
DS3815HCPA1B1A		V891228	V890308
DS3815HCPA1D1A	PSP3815HCPAXXAB	V920716	V890308
DS3815HCPA1E1A	PSP3815HCPAXXAC	920716	V981006
DS3815HCPC	PSP3815HCPCXXAA		
DS3815HCPC1E1A	PSP3815HCPCXXAC	V901102	V890308
DS3815HCPC	PSP3815HCPCXXAD		
DS3815HCPC	PSP3815HCPCXXAE	V891227	V890308
DS3815HCPC	PSP3815HCPCXXAF		
DS3815HCPE1E1A	PSP3815HCPEXXAC	V901001	V890308
DS3815HCPE	PSP3815HCPEXXAD	V920716	V890303
DS3815HCPE	PSP3815HCPEXXAE	V920716	981006
DS3815HCPE	PSP3815HCPEXXAF		

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TEST WRITTEN BY: Eric Rouse

DATE: 05-12-98

TEST VERIFIED BY: Robert K Duvall

DATE: 08-08-98