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CAROLINA POWER AND LIGHT COMPANY

H. B. ROBINSON SEG PLANT

PLANT OPERATING MANUAL

VOLUME 4

PART 7

MAINTENANCE SURVEILLANCE TEST PROCEDURE
STATION BATTERY SERVICE TEST
MST-921

REVISION 1

Effective Date 1-06-89

RECOMMENDED BY: _____ 12/23/88
Maintenance Supervisor — Date

APPROVED BY: D R Lewis 12/27/88
Manager - Maintenance — Date

CONTROLLED
RECIPIENT
ID 004

INFO ONLY

p 1 of 45

4.0 PRECAUTIONS AND LIMITATIONS (Continued)

4.13 Neutralize any spilled electrolyte with a solution of water and baking soda or equivalent neurtralizer (approximately one pound of soda to one gallon of water). Never use any other type solvent on the battery cells.

4.14 If the concentration of gases is more than 20% of the Lower Explosive Limit (LEL) as read on the explosimeter, terminate the test until the problem can be solved.

****

CAUTION

LEAD ACID STORAGE BATTERIES PRODUCE HYDROGEN GAS WHICH BURNS OR EXPLODES IF IGNITED. TO PREVENT CONCENTRATIONS OF HYDROGEN, ADEQUATE VENTILATION MUST BE MAINTAINED. THE ELECTROLYTE USED IN THESE BATTERIES IS DANGEROUS TO BOTH PERSONNEL AND EQUIPMENT; THEREFORE, ANY LEAKAGE OR SPILLAGE SHOULD BE PREVENTED.

****

5.0 SPECIAL TOOLS AND EQUIPMENT

- Portable fire extinguisher to be located outside the battery room entrance.
- Explosimeter to measure hydrogen content of the air in the battery room.
- Hi-rate Discharge Tester
- Digital Voltmeter
- Hydrometer
- Torque Wrench (A Battery = 140" Lb, B Battery = 90" Lb)
- Thermometer
- Disconnect Switch

LIST OF EFFECTIVE PAGES

EFFECTIVE PAGES	REVISION
Cover Sheet	1
LEP	1
3 through 5	0
6	1
7 through 11	0
12	1
13 through 22	0
23 through 24	1
25 through 34	0

1.0 PURPOSE

The purpose of this test is to demonstrate that each Station Battery will carry its expected emergency shutdown load without the battery terminal voltage falling below 107 volts for A battery and 106 volts for B battery.

2.0 REFERENCES

2.1 Technical Specifications 6.5.1.1, Station Batteries
2.2 FSAR Section 8.3.2, DC Power System (125 Volt)
2.3 Could Station Battery Manual
2.4 Company Safety Manual
2.5 IEEE 450-1980
2.6 Power Conversion Products Instruction Manual
2.7 PM-411

3.0 PREREQUISITES

3.1 Have Technical Support verify that the load profile in Table III, ATTACHMENT 8.7, is the latest revision of Calculation 7988-E1 and E3.

7988-E1 Rev. 4 7988-E3 Rev. 3

[signature] Tech Support Elec ______ 11/13/90
Signature Date

3.2 This procedure has been verified to be the most current revision.

[signature] ______ 11-13-90
Signature Date

3.3 Obtain the Shift Foreman's permission to start this test.

[initials]
Initials

3.4 The batteries may be tested in any order.

3.0 PREREQUISITES (Continued)

3.5 All special tools and equipment should be assembled and current calibration of Measuring and Test Equipment used as Field Comparison Standards verified.

3.6 The plant is in cold shutdown condition.

3.7 Water level in all cells of both batteries is above the low level mark.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Observe all standard electrical precautions.

4.2 Do not permit smoking or open flames in the battery room.

4.3 Ensure the battery room exhaust ventilation system is running during this test.

4.4 When connecting/disconnecting the batteries from their respective DC buses or the test load, do so with firm, sharp motions to keep the electrical arc to a minimum. Remember; BATTERY CIRCUITS ARE ALWAYS ENERGIZED!

4.5 Work carefully to prevent getting electrolyte in the eyes or on skin or clothes.

4.6 Use protective clothing and equipment as needed. (Rubber gloves, aprons, shoes, face shield).

4.7 Do not operate any plant circuit breakers without permission of the Shift Foreman.

4.8 Notify Fire Protection when Door FD-11 is blocked open. Tech. Spec. 3.14.7.2 limits Fire Door 11 open for seven days maximum.

4.9 Notify Fire Protection to inhibit the fire zone just prior to start [illegible] (Fire Detection Zone 20-E1/E2 Room). Maintain fire watch while inhibited. Tech. Spec. 3.14.5.2 limits Zone 20 inhibited for fourteen days maximum.

4.10 Electrically insulate the handles and shanks of all tools.

4.11 Ensure unobstructed egress from the battery room.

4.12 Ensure that test leads are connected with sufficient length to prevent arcing in the vicinity of the cells.

6.0 ACCEPTANCE CRITERIA

This Procedure is acceptable when the following requirement is met:

- The batteries have demonstrated the ability to handle emergency loads as outlined in Table III (ATTACHMENT 8.7).
- The equipment meets tolerances as stated in the procedure and/or the data sheet.

		INITIALS
7.0	TEST INSTRUCTIONS	
7.1	Battery A Test Instructions	
7.1.1	Inspect battery room and battery to ensure that:	
	• Ventilation system is operating.	RDB
	• All cell tops are clean and free of foreign matter.	RDB
	• The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.	RDB
	• "A" or "A-1" charger is in FLOAT operation.	RDB
7.1.2	Collect the following data and record on Data Sheet 1, (ATTACHMENT 8.1):	
	• Measure the specific gravity of each cell and record data.	RDB
	• Measure the temperature of every fifth cell and record data. Cell temperature must be below 110°F and above 67°F for this test.	RDB
	• Calculate the average electrolyte temperature and record.	RDB
	• Determine the discharge temperature correction factor (K) from Table I (ATTACHMENT 8.5) and record.	RDB
	• Measure the electrolyte level with respect to the High level line on the front of the cell.	RDB
	• Calculate the corrected specific gravity for each cell using the information on Table II (ATTACHMENT 8.6) and record the data.	RDB

7.0 TEST INSTRUCTIONS (Continued) INITIALS

- Record the normal charging current on Data Sheet 2, (ATTACHMENT 8.2). RDB

7.1.3 Determine the discharge current for each time period with the following formula and record on Table III: (ATTACHMENT 8.7).

DISCHARGE CURRENT = RATED CURRENT ÷ K

K = Discharge Current correction factor for the initial electrolyte temperature obtained from Table 1 (ATTACHMENT 8.5).

RATED CURRENT = Obtain from Table III (ATTACHMENT 8.7)

Average temperature may be obtained from Data Sheet 1 (ATTACHMENT 8.1).

7.1.3.1 Set up the Load Tester for the time and corrected amps from Table III. RDB

7.1.3.2 Set up the Load Tester for the test to terminate at the minimum terminal voltage of 107 volts. RDB

7.1.3.3 Set up the Load Tester low cell voltage to alarm at 1.75 volts. RDB

7.1.3.4 Set up the Load Tester timer to stop the test after one hour and five minutes. RDB

7.1.4 Check the atmosphere of the battery room with the explosimeter.

Safe RDB Unsafe N/A

7.1.5 Battery to Bus Disconnection

NOTE

This section must be performed at both cells 1 and 60.

7.1.5.1 Using a shop made jumper rig (ensure that the breaker on the rig is open), install the jumper rig across the applicable point (where the cable end is connected to the connector on the cell) to be disconnected.

7.1.5.2 Close the jumper rig breaker.

7.0 TEST INSTRUCTIONS (Continued) INITIALS

7.1.5.3 Disconnect and remove the cables from the connector at the applicable (1 or 60) cell.

7.1.5.4 Open the jumper rig breaker.

7.1.5.5 Remove the jumper rig from the applicable cable and cell.

7.1.5.6 Tape the exposed end of the cables removed from the cell.

NOTE

Connections to A Battery should be torqued to 140" Lb (maximum - 150" Lb) if the cell post is disconnected.

7.1.6 Connect the Load Tester to the battery (via the Disconnect Switch) in the following manner:

1. Connect the positive battery terminal to the ±140V bus bar of the tester. (Use high current lead.) RDB
2. Connect the negative battery terminal to the negative bus bar of the tester. (Use high current lead.) RDB
3. Connect the Data Logger to the battery cells. RDB

7.1.7 Have the Data Logger print out the battery voltage and the individual cell voltage for cells 1 through 60. Record the cell voltage and the battery voltage on Data Sheet 2, (ATTACHMENT 8.2) or attach printout. RDB

7.1.7.1 Have the Data Logger print out the individual cell voltages every 10 minutes during the test and monitor the printout for a low cell reading.

7.1.7.2 During the discharge test (starting at 30 seconds into test), verify and record on Data Sheet 3 (ATTACHMENT 8.3) the digital panel meter readings.

7.1.8 Observe the battery during the test for any irregularities such as intercell connector heating. If any is observed, record in Section 7.3. RDB

7.1.9 Start the load test. RDB

NOTE

The Load Tester will continue to run and discharge the battery until either of the following conditions occur:

- An "individual cell voltage" should not be allowed to go below .5 volts.
- As soon as the one hour readings are taken, terminate the test.

7.1.10 When the test is terminated, record the elapsed time.

1 HRS

7.1.11 When the test is terminated, verify the test was completed satisfactorily. If the discharge continued for one hour as per Table III without an ICV reaching .5 volts and the battery voltage remains above 107 volts, the test is considered satisfactory.

Satisfactory ADD Unsatisfactory N/A

7.1.12 Check the atmosphere of the battery room with the explosimeter. Safe SAT Unsafe N/A

7.1.13 Disconnect the Load Tester from the battery. ADD

7.1.14 Restore the following fire protection equipment to normal. KT

7.1.14.1 Close Door FD-11. ADD

7.1.14.2 Notify Fire Protection to restore Fire Detection Zone 20 and terminate the fire watch. ADD

7.1.15 Set up a Digital Voltmeter to measure 0 to 50 mVDC and connect to the terminals of the battery charger ammeter. The 0 to 50 mV signal corresponds to 0 to 500 amps, charger current. ADD

7.1.16 Return to Service

NOTE

This section must be performed at both cells 1 and 60. Clean and assemble connections as per PM-411.

7.1.16.1 Using a jumper rig (ensure that the breaker on the rig is open), install the jumper rig across the applicable point (where the cable end connects to the connector on the cell) to be reconnected.

7.1.16.2 Close the jumper rig breaker.

7.1.16.3 Assemble the cable end (remove the tape from the exposed end) connector and torque the connection to 140 inch pounds nominal (maximum 150 inch pounds).

7.1.16.4 Open the jumper rig breaker.

7.1.16.5 Remove the jumper rig from the applicable cable and cell.

7.1.17 Place the "Float-Equalize" switch in the EQUALIZE position for the battery bank. Record the date and time of the start of the charge.

7.1.18 Measure and set the Bank Equalize Voltage (measured at the battery terminals) to 138.5 ± .5V.

7.1.19 Record the following information on the appropriate data sheets (ATTACHMENT 8.4).

- MCC Voltmeter reading (±1V of measured voltage)
- Charger Voltmeter reading (±1V of measured voltage)

7.0 TEST INSTRUCTIONS (Continued)

7.1.20 Record the charging current and pilot cell temperature at one (1) hour intervals until stabilized (no further reduction in charging current for three (3) consecutive hours).

NOTE

The current can be considered stable if the change in current over the most recent 3-hour period was equal to or less than ten percent (10%). A stabilized current can also be determined by the following equation:

$$\frac{\text{Current at Time T}}{\text{Current at Time T +3 Hr}} \leq 1.10$$

7.1.21 (T=Ø) Record the date and time that the charging current stabilized (the battery charge duration is measured from this point).

NOTE

Distilled water may be added to raise electrolyte levels to between the level marks once charging has begun. Record the amount of water added to each cell.

7.1.22 (T=95) After ninety-five (95) hours, record the voltages of each cell in the battery bank. Circle the lowest cell voltage.

7.1.23 (T=105) After one hundred five (105) hours, record the cell voltage of the lowest cell.

7.1.24 If the lowest cell voltage has risen by 0.01 volts or more in the last ten (10) hours, charge for another ten (10) hour period and repeat this step. (Continue charging in ten (10) hour increments until the voltage does not rise).

7.1.25 If the lowest cell voltage shows no increase (< .01V) in a ten (10) hour period, then go to the next step.

7.1.26 Place the "Float-Equalize" switch in the FLOAT position. Record the time and date the charge was completed.

7.0 TEST INSTRUCTIONS (Continued) INITIALS

7.1.27 Approximately one (1) week after the battery has been on float, record the following:

1. date
2. all cell voltages to nearest 0.01V
3. all cell uncorrected specific gravities
4. all cell electrolyte levels
5. temperature of every 5th cell
6. color of bottom deposit (D = Dark, G = Gray)

7.1.28 Complete the "Special Procedure Charge Data" section of the DATA REDUCTION SHEET using the after charge data of Step 7.1.27.

7.1.29 Record the data following the previous Extended Equalizer charge in the appropriate column of the data sheet.

7.1.30 Compare the data of this test with the data taken following the most recent Extended Equalizer charge. Note any variations that may indicate battery trouble under "Comments" (Step 7.3).

NOTE

The normal specific gravity of the station batteries is 1.215 @ 77°F, but it may range from 1.205 up to 1.225 @ 77°F with the electrolyte at the high level mark. The jars should be clean on the outside and the bottom deposit should be dark in color. A gray deposit may indicate trouble. If any of these conditions persist, corrective action should be taken.

7.2 Battery B Test Instructions

7.2.1 Inspect battery room and battery to ensure that:

- Ventilation system is operating. ADD
- All cell tops are clean and free of foreign matter. ADD
- The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration. ADD
- "B" or "B-1" charger is in FLOAT operation. ADD

7.2.2 Collect the following data and record on Data Sheet 1, (ATTACHMENT 8.1):

- Measure the specific gravity of each cell and record data. ADB
- Measure the temperature of every fifth cell and record data. Cell temperature must be below 110°F and above 67°F for this test. ADB
- Calculate the average electrolyte temperature and record. ADB
- Determine the Discharge Temperature Correction Factor (K) from Table I (ATTACHMENT 8.5) and record. ADB
- Measure the electrolyte level with respect to the High level line on the front of the cell. ADB
- Calculate the corrected specific gravity for each cell using the information on Table II (ATTACHMENT 8.6) and record the data. ADB
- Record normal charging current on Data Sheet 2 (ATTACHMENT 8.2). ADB

7.2.3 Determine the discharge current for each time period with the following formula and record on Table III: (ATTACHMENT 8.7)

DISCHARGE CURRENT = RATED CURRENT I.+ K

K = Discharge current correction factor for the initial electrolyte temperature obtained from Table 1 (ATTACHMENT 8.5).

RATED CURRENT = Obtain from Table III (ATTACHMENT 8.7)

Average Temperature may be obtained from Data Sheet 1 (ATTACHMENT 8.1).

7.2.3.1 Set up the Load Tester for the time and corrected amps from Table III.

7.2.3.2 Set up the Load Tester for the test to terminate at the minimum terminal voltage of 106 volts. ADB

7.2.3.3 Set up the Load Tester low cell voltage to alarm at 1.75 volts. ADB

7.0 TEST INSTRUCTIONS (Continued) INITIALS

7.2.3.4 Set up the Load Tester timer to stop the test after one hour and five minutes. [initials]

7.2.4 Check the atmosphere of the battery room with the explosimeter. Safe [initials] Unsafe N/A

7.2.5 Battery to Bus Disconnection

NOTE

This section must be performed at both cells 1 and 60.

7.2.5.1 Using a jumper rig (ensure that the breaker on the rig is open), install the jumper rig across the applicable point (where the cable end is connected to the connector on the cell) to be disconnected.

7.2.5.2 Close the jumper rig breaker.

7.2.5.3 Disconnect and remove the cables from the connector at the applicable (1 or 60) cell.

7.2.5.4 Open the jumper rig breaker.

7.2.5.5 Remove the jumper rig from the applicable cable and cell.

7.2.5.6 Tape the exposed end of the cables removed from the cell.

NOTE

Connections to B Battery should be torqued to 90" Lb. (Maximum - 100" Lb) if the cell post is disconnected.

7.2.6 Connect the Load Tester to the battery (via the Disconnect Switch) in the following manner:

1. Connect the positive battery terminal to the 1140V bus bar of the tester. (Use high current lead.) [initials]
2. Connect the negative battery terminal to the negative bus bar of the tester. (Use high current lead.) [initials]
3. Connect the Data Logger to the battery cells. [initials]

7.0 TEST INSTRUCTIONS (Continued) INITIALS

7.2.7 Have the Data Logger print out the battery voltage and the individual cell voltage for cells 1 through 60. Record the cell voltage and the battery voltage on Data Sheet 2, (ATTACHMENT 8.2). ADB

7.2.7.1 Have the Data Logger print out the individual cell voltages every 10 minutes during the test and monitor the printout for a low cell reading.

7.2.7.2 During the discharge test (starting at 30 seconds into test), verify and record on Data Sheet 3 (ATTACHMENT 8.3) the digital panel meter readings.

7.2.8 Observe the battery during the test for any irregularities such as intercell connector heating. If any observed, record in Section 7.3. ADB

7.2.9 Start the load test. ADB

NOTE

The Load Tester should continue to run and discharge the battery until either of the following conditions occur:

- An "individual cell voltage" should not be allowed to go below .5 volts.
- As soon as the one hour readings are taken, terminate the test.

7.2.10 When the test is terminated, record the elapsed time.

1 HRS

7.2.11 When the test is terminated, verify the test was completed satisfactorily. If the discharge continued for one hour as per Table III without an ICV reaching .5 volts and the battery voltage remains above 100 volts, the test is considered satisfactory.

Satisfactory ✓ Unsatisfactory N/A

7.2.12 Check the atmosphere of the battery room with the explosimeter. Safe ADB Unsafe N/A

7.2.13 Disconnect the Load Tester from the battery. ADB

INITIALS

7.2.14 Restore the following fire protection equipment to normal.

7.2.14.1 Close door FD-11.

7.2.14.2 Notify Fire Protection to restore Fire Detection Zone 20 and terminate the fire watch.

7.2.15 Set up a Digital Voltmeter to measure 0 to 50 mVDC and connect to the terminals of the battery charger ammeter. The 0 to 50 mV signal corresponds to 0 to 500 amps, charger current.

7.2.16 Return to Service

NOTE

This section must be performed at both cells 1 and 60. Clean and assemble connections as per PM-411.

7.2.16.1 Using a jumper rig (ensure that the breaker on the rig is open), install the jumper rig across the applicable point (where the cable end connects to the connector on the cell) to be reconnected.

7.2.16.2 Close the jumper rig breaker.

7.2.16.3 Assemble the cable end (remove the tape from the exposed end) connector and torque the connection to 90 inch pounds nominal (maximum is 100 inch pounds).

7.2.16.4 Open the jumper rig breaker.

7.2.16.5 Remove the jumper rig from the applicable cable and cell.

7.2.17 Place the "Float-Equalize" switch in the EQUALIZE position for the battery bank. Record the date and time of the start of the charge.

7.2.18 Measure and set the Bank Equalize Voltage (measured at the battery terminals) to 138.5 ± .5V.

7.2.19 Record the following information on the appropriate data sheets (ATTACHMENT 8.4).

- MCC Voltmeter reading (±1V of measured voltage)
- Charger Voltmeter reading (±1V of measured voltage)

7.2.20 Record the charging current and pilot cell temperature at one (1) hour intervals until stabilized (no further reduction in charging current for three (3) consecutive hours).

NOTE

The current can be considered stable if the change in current over the most recent 3-hour period was equal to or less than ten percent (10%). A stabilized current can also be determined by the following equation:

$$\frac{\text{Current at Time T}}{\text{Current at Time T +3 Hr}} \leq 1.10$$

7.2.21 (T=Ø) Record the date and time that the charging current stabilized (the battery charge duration is measured from this point).

NOTE

Distilled water may be added to raise electrolyte levels to between the level marks once charging has begun. Record the amount of water added to each cell.

7.2.22 (T=95) After ninety-five (95) hours, record the voltages of each cell in the battery bank. Circle the lowest cell voltage.

7.2.23 (T=1Ø5) After one hundred five (105) hours, record the cell voltage of the lowest cell.

7.2.24 If the lowest cell voltage has risen by 0.01 volts or more in the last ten (10) hours, charge for another ten (10) hour period and repeat this step. (Continue charging in ten (10) hour increments until the voltage does not rise).

7.2.25 If the lowest cell voltage shows no increase (< .01V) in a ten (10) hour period, then go to the next step.

7.2.26 Place the "Float-Equalize" switch in the FLOAT position. Record the time and date the charge was completed.

7.0 TEST INSTRUCTIONS (Continued)

7.2.27 Approximately one (1) week after the battery has been on float, record the following:

1. date
2. all cell voltages to nearest 0.01V
3. all cell uncorrected specific gravities
4. all cell electrolyte levels
5. temperature of every 5th cell
6. color of bottom deposit (D = Dark, G = Gray)

7.2.28 Complete the "Special Procedure Charge Data" section of the DATA REDUCTION SHEET using the after charge data of Step 7.2.27.

7.2.29 Record the data following the previous Extended Equalizer charge in the appropriate column of the data sheet.

7.2.30 Compare the data of this test with the data taken following the most recent Extended Equalizer charge. Note any variations that may indicate battery trouble under "Comments" (Step 7.3).

NOTE

The normal specific gravity of the station batteries is 1.215 @ 77°F, but it may range from 1.205 up to 1.225 @ 77°F with the electrolyte at the high level mark. The jars should be clean on the outside and the bottom deposit should be dark in color. A gray deposit may indicate trouble. If any of these conditions persist, corrective action should be taken.

7.0 TEST INSTRUCTIONS (Continued)

7.3 Completion and Review

TEST EQUIPMENT USED	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
FLUKE DVM	8842A	4672281	3-20-91
H-P DVM	3468A	2137A11181	4-24-91
N/A ←			→

Comments & Observations See attached addendum sheet.
* DIFFERENCE BETWEEN CHARGER INDICATOR AND DVM ARE WITHIN ALLOWED TOLERANCES. Leroy Lood 2/11/91

Test Complete: Date: 11-26-90 Time: 1300

Test Performed By: [signature] / [signature] / Roger Blackwell

Test Satisfactory: (YES) / NO (Circle One)

If the acceptance criteria is not met, the Shift Foreman must sign.

N/A
Shift Foreman — Date: N/A

Reviewed By: Leroy Lood
I&C Foreman — Date: 11/27/90

Reviewed By: Marvin Loudermilk
Unit 2 - Maintenance Supervisor — Date: 12-10-90

Corrected copy

8.0 ATTACHMENTS

8.1 Data Sheet 1

8.2 Data Sheet 2

8.3 Data Sheet 3

8.4 Data Sheet 4

8.5 Table I

8.6 Table II

8.7 Table III

DATA SHEET 1
BATTERY A

CELL NO.	MEASURED SPECIFIC GRAVITY	CELL TEMP. °F	CELL LEVEL INS.	CORRECTED SPECIFIC GRAVITY
1	1.218	85°	0	1.220
2	1.226		-1/4	1.222
3	1.222		-1/4	1.218
4	1.222		+1/8	1.227
5	1.222	85°	-1/4	1.218
6	1.212		-1/8	1.211
7	1.222		-1/8	1.221
8	1.224		-1/4	1.220
9	1.226		-1/4	1.222
10	1.218	83°	-1/8	1.217
11	1.224		-1/8	1.223
12	1.224		-1/8	1.223
13	1.212		0	1.214
14	1.212		-1/8	1.211
15	1.214	81°	-1/8	1.212
16	1.218		-1/8	1.218
17	1.222		-1/4	1.217
18	1.222		-1/4	1.217
19	1.224		-1/8	1.222
20	1.220	79°	-1/8	1.218
21	1.224		-1/2	1.213
22	1.228		-1/16	1.227
23	1.230		-1/16	1.230 ~~1.224~~
24	1.224		0	1.225
25	1.230	79°	-1/16	1.229
26	1.212		-1/16	1.211
27	1.220		-1/8	1.218
28	1.220		-1/8	1.218
29	1.218		-1/8	1.216
30	1.214	79°	-1/8	1.211

CELL NO.	MEASURED SPECIFIC GRAVITY	CELL TEMP. °F	CELL LEVEL INS.	CORRECTED SPECIFIC GRAVITY
31	1.222	78°	-3/4	1.204
32	1.220		-1/4	1.214
33	1.222		-1/4	1.216
34	1.220		-1/16	1.219
35	1.218	78°	-1/8	1.215
36	1.218		-1/8	1.215
37	1.218		-1/4	1.212 ~~1.215~~
38	1.212		-1/8	1.209
39	1.220		-1/4	1.214
40	1.220	78°	-1/4	1.214
41	1.216		-1/4	1.210
42	1.222		-1/4	1.216
43	1.222		-1/4	1.216
44	1.220		-1/4	1.214
45	1.220	78°	-1/8	1.217
46	1.212		-1/8	1.209
47	1.224		-1/4	1.218
48	1.220		-1/2	1.205
49	1.224		-3/8	1.215 ~~1.213~~
50	1.224	82°	-3/8	1.217
51	1.226		-1/2	1.216
52	1.224		-3/8	1.217
53	1.224		-3/8	1.217
54	1.212		-1/4	1.208
55	1.210	85°	-1/4	1.206
56	1.214		-1/8	1.213
57	1.218		-1/4	1.214
58	1.228		0	1.230
59	1.220		0	1.222
60	1.220	85°	0	1.222

AVERAGE Electrolyte Temp. 81 °F

AVERAGE Corrected Specific Gravity 1.217

Temperature Correction Factor K .976
(From Table I)

DATA SHEET 1
BATTERY B

CELL NO.	MEASURED SPECIFIC GRAVITY	CELL TEMP. °F	CELL LEVEL INS.	CORRECTED SPECIFIC GRAVITY
1	1.216	82°	- 1/8	1.214
2	1.216		- 1/16	1.216
3	1.220		- 1/8	1.219
4	1.220		- 1/16	1.220
5	1.218	80°	- 1/8	1.216
6	1.220		- 1/8	1.218
7	1.224		- 3/8	1.216
8	1.220		- 1/4	1.215
9	1.214		- 1/8	1.212
10	1.216	81°	- 3/8	1.208
11	1.216		- 1/4	1.211
12	1.218		- 3/8	1.210
13	1.216		- 1/4	1.211
14	1.210		- 1/4	1.205
15	1.214	78°	- 1/4	1.208
16	1.224		- 1/2	1.212
17	1.214		- 3/8	1.205
18	1.212		- 1/8	1.209
19	1.214		- 1/16	1.213
20	1.212	79°	- 1/16	1.211
21	1.214		- 3/16	~~1.213~~ 1.210
22	1.216		- 1/4	1.210
23	1.216		- 3/16	1.212
24	1.212		- 1/16	1.211
25	1.216	77°	- 3/16	1.212
26	1.222		- 3/16	1.218
27	1.210		- 1/4	1.209
28	1.220		- 3/8	1.211
29	1.212		- 1/4	1.206
30	1.216	78°	- 1/4	1.210

CELL NO.	MEASURED SPECIFIC GRAVITY	CELL TEMP. °F	CELL LEVEL INS.	CORRECTED SPECIFIC GRAVITY
31	1.224	79°	- 1/4	1.218 ~~1.219~~
32	1.216		- 3/16	1.212
33	1.220		- 1/16	1.219
34	1.220		- 1/4	1.214
35	1.220	77°	- 1/16	1.219
36	1.220		- 3/16	1.216
37	1.212		- 1/4	1.206
38	1.222		- 1/4	1.216
39	1.214		- 3/16	1.210
40	1.212	79°	- 3/16	~~1.212~~ 1.208
41	1.208		- 1/8	1.206
42	1.212		- 1/8	1.210
43	1.222		- 1/4	1.217
44	1.220		- 1/4	1.215
45	1.220	78°	- 1/4	1.214
46	1.222		- 1/4	1.216
47	1.212		- 3/16	1.208
48	1.224		- 3/8	1.215
49	1.224		- 1/4	1.218
50	1.216	80°	- 3/16	1.212
51	1.210		- 1/8	1.208
52	1.220		- 3/16	1.216
53	1.212		- 1/8	1.210
54	1.212		- 1/16	1.211
55	1.220	79°	- 1/8	1.218
56	1.216		- 1/4	1.211
57	1.218		- 3/16	1.214
58	1.214		0	1.215
59	1.212		- 1/4	1.207
60	1.222	80°	- 3/8	1.214

AVERAGE Electrolyte Temp. 79 °F

AVERAGE Corrected Specific Gravity 1.213

Temperature Correction Factor K .987
(From Table I)

3-10-09 2-23-08

DATA SHEET 2
BATTERY A

CELL NO.	CELL VOLTAGE	CELL NO.	CELL VOLTAGE	CELL NO.	CELL VOLTAGE	CELL NO.	CELL VOLTAGE
1	2.11	16	2.13	31	2.15	46	2.13
2	2.11	17	2.14	32	2.13	47	2.13
3	2.12	18	2.13	33	2.13	48	2.12
4	2.12	19	2.14	34	2.14	49	2.13
5	2.11	20	2.13	35	2.13	50	2.13
6	2.11	21	2.13	36	2.14	51	2.13
7	2.12	22	2.14	37	2.13	52	2.12
8	2.12	23	2.14	38	2.13	53	2.12
9	2.12	24	2.14	39	2.14	54	2.13
10	2.12	25	2.14	40	2.14	55	2.12
11	2.12	26	2.13	41	2.13	56	2.12
12	2.14	27	2.14	42	2.14	57	2.12
13	2.11	28	2.13	43	2.14	58	2.13
14	2.11	29	2.14	44	2.14	59	2.13
15	2.13	30	2.12	45	2.14	60	2.13

Levy Ward 2-11-91

BATTERY VOLTAGE: 129.1

NORMAL CHARGE CURRENT: 48 A

TIME BATTERY CHARGE STARTS: N/A

TIME BATTERY CHARGE INTERRUPTED: N/A

TIME BATTERY CHARGE RESUMED: N/A

Battery Charger Used for Test:
"A" _____ or "A-1" ✓

Corrected copy

DATA SHEET 2
BATTERY B

CELL NO.	CELL VOLTAGE	CELL NO.	CELL VOLTAGE	CELL NO.	CELL VOLTAGE	CELL NO.	CELL VOLTAGE
1	2.13	16	2.17	31	2.16	46	2.15
2	2.14	17	2.14	32	2.17	47	2.14
3	2.16	18	2.15	33	2.14	48	2.17
4	2.15	19	2.16	34	2.14	49	2.16
5	2.15	20	2.17	35	2.15	50	2.16
6	2.15	21	2.14	36	2.16	51	2.14
7	2.16	22	2.17	37	2.16	52	2.16
8	2.15	23	2.15	38	2.16	53	2.16
9	2.14	24	2.14	39	2.15	54	2.13
10	2.11	25	2.17	40	2.14	55	2.17
11	2.14	26	2.15	41	2.14	56	2.15
12	2.16	27	2.16	42	2.14	57	2.14
13	2.16	28	2.16	43	2.17	58	2.15
14	2.14	29	2.16	44	2.16	59	2.14
15	2.16	30	2.15	45	2.15	60	2.16

Larry Watts 2-11-91

BATTERY VOLTAGE: 130.6

NORMAL CHARGE CURRENT: 55A

TIME BATTERY CHARGE STARTS: N/A

TIME BATTERY CHARGE INTERRUPTED: N/A

TIME BATTERY CHARGE RESUMED: N/A

Battery Charger Used for Test:
"B" _____ or "B-1" ✓

Corrected copy

DATA SHEET 3

TIME INTO TEST	A BATTERY-TEST I VOLTAGE DPM	A BATTERY-TEST I CURRENT DPM	TEST 2 IF NEEDED VOLTAGE DPM	TEST 2 IF NEEDED CURRENT DPM	B BATTERY-TEST I VOLTAGE DPM	B BATTERY-TEST I CURRENT DPM	TEST 2 IF NEEDED VOLTAGE DPM	TEST 2 IF NEEDED CURRENT DPM
30 SECONDS	113.1	414	N/A	N/A	111.9	234	N/A	N/A
10 MINUTES	115.7	336			116.8	124.6		
20 MINUTES	115.3	336			116.4	124.6		
30 MINUTES	114.8	336			115.8	124.6		
40 MINUTES	114.3	336			115.2	124.6		
50 MINUTES	113.7	336			114.5	124.6		
60 MINUTES	112.5	372			112.3	159.2		
70 MINUTES	N/A	N/A			N/A	N/A		
80 MINUTES	N/A	N/A			N/A	N/A		
90 MINUTES	N/A	N/A			N/A	N/A		

DATA REDUCTION SHEET

	Bank A		Bank B	
	cell no.	value	cell no.	value
highest cell volts				
lowest cell volts		N/A		
Voltage Spread (highest-lowest)				
Voltage Spread (previous ext. equal.)				
Difference (present-previous)				
highest cell sp. gr.				
lowest cell sp. gr.				
Sp. Gr. Spread (highest-lowest)				
Sp. Gr. Spread (previous ext. equal.)				
Difference (present-previous)				
Date of Last Extended Equal.				
Average Bank Temp.				
Sp. Gr. Low Limit				N/A

Sp. Gr. Low Limit = $[77 - \text{Ave Bank Temp}] \times \frac{.001}{3} + 1.205$

Special Procedure Charge Data

highest cell volts	2.289 vdc (cell 31)	2.231 vdc (cell 28)
lowest cell volts	2.153 vdc (cell 13)	~~2.153 vdc (cell 54)~~ 2.151 VDC (cell 17)
Voltage Spread (highest-lowest)	.136 v	~~.076~~ .08
highest cell sp. gr.	1.224 (cell 50)	1.222 (cell 3)
lowest cell sp. gr.	1.208 (cell 13)	1.208 (cell 41)
Sp. Gr. Spread (highest-lowest)	.016	.014

~~11/27/96~~ 11-27-96

BATTERY BANK A

	BEFORE TEST DATA					DURING CHARGE DATA	AFTER CHARGE DATA (DATE: 11-25-90)						PREVIOUS EXTENDED EQUALIZING AFTER CHARGE DATA (DATE: 9-6-90)			
	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Water Added	Cell Volts	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Bottom Color		Cell Volts	SP Gravity (Uncorr.)	Temp	Level
1	2.11	1.218	85	0	0	2.358	2.167	1.210	85	0	D		2.297	1.221	77	-3/16
2	2.11	1.226	↓	-1/4	↑	2.363	2.169	1.214	↓	-1/16	D		2.157	1.217	↓	-1/4
3	2.12	1.222		-1/4		2.371	2.178	1.214		-1/16	D		2.161	1.220		-1/4
4	2.12	1.222		+1/4		2.266	2.171	1.210		0	D		2.180	1.217		0
5	2.11	1.227	95	-1/4		2.265	2.170	1.210	85	-1/16	D		2.161	1.217	76	0
6	2.11	1.212	↓	-1/4		2.328	2.187	1.210	↓	-1/16	D		2.176	1.217	↓	0
7	2.12	1.229		-1/4		2.369	2.180	1.210		-1/16	D		2.164	1.217		-1/8
8	2.12	1.224		-1/4		2.269	2.179	1.210		-1/8	D		2.155	1.211		-3/16
9	2.12	1.226	↓	-1/4		2.279	2.184	1.216	↓	0	D		2.172	1.216		-1/8
10	2.12	1.218	93	-1/4		2.267	2.177	1.208	83	0	D		2.167	1.216	77	-1/8
11	2.12	1.224	↓	-1/4		2.306	2.177	1.212	↓	-1/8	D		2.170	1.213	↓	0
12	2.14	1.224		-1/4		2.325	2.207	1.218		-1/8	D		2.177	1.221		-3/16
13	2.11	1.212				(2.344)	(2.153)	1.208		-1/16	D		2.174	1.218		-3/16
14	2.11	1.212	↓	0		2.246	2.155	1.210	↓	-1/4	D		2.181	1.215	↓	-3/16
15	2.13	1.214	81	-1/4		2.321	2.205	1.212	82	-1/16	D		2.178	1.216	76	0
16	2.13	1.218	↓	-1/4		2.352	2.229	1.212	↓	-1/16	D		2.185	1.212	↓	0
17	2.14	1.222		-1/4		2.333	2.221	1.210		-1/16	D		2.161	1.221		-1/8
18	2.13	1.222		-1/4		2.321	2.201	1.215		-1/16	D		2.177	1.216		-1/16
19	2.14	1.224	↓	-1/4		2.323	2.210	1.218	↓	-1/16	D		2.179	1.223	↓	-1/8
20	2.13	1.220	79	-1/4		2.320	2.190	1.211	80	-1/16	D		2.173	1.223	78	-1/8
21	2.13	1.224	↓	-1/2		2.292	2.189	1.217	↓	-1/16	D		2.183	1.224	↓	-1/16
22	2.14	1.228		-1/16		2.322	2.192	1.218		0	D		2.173	1.221		-1/16
23	2.14	1.230		-1/16		2.318	2.195	1.216		0	D		2.168	1.223		-1/8
24	2.14	1.224	↓	0		2.329	2.201	1.220	↓	0	D		2.176	1.216		-1/8
25	2.14	1.230	79	-1/16		2.326	2.191	1.218	79	-1/16	D		2.159	1.216		-1/8
26	2.13	1.212	↓	-1/16		2.323	2.185	1.210	↓	-1/16	D		2.177	1.217	77	-1/16
27	2.14	1.220		-1/4		2.329	2.194	1.214		-1/16	D		2.165	1.226	↓	-1/16
28	2.13	1.220		-1/4		2.320	2.183	1.214		-1/16	D		2.170	1.224		-1/8
29	2.14	1.218	↓	-1/4		2.331	2.212	1.208	↓	-1/16	D		2.185	1.222		-3/16
30	2.12	1.214	78	-1/4	0	2.291	2.171	1.210	74	-1/16	D		2.170	1.220	77	-1/8

BATTERY ROOM AMBIENT TEMP: 79°

BATTERY BANK A

	BEFORE TEST DATA					DURING CHARGE DATA	AFTER CHARGE DATA (DATE: 11-25-90)					PREVIOUS EXTENDED EQUALIZING AFTER CHARGE DATA (DATE: 9-6-90)			
	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Water Added	Cell Volts	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Bottom Color	Cell Volts	SP Gravity (Uncorr.)	Temp	Level
31	2.15	1.222	78	-1/4	O	2.412	2.287	1.222	79	-1/4	D	2.172	1.220	77	-1/4
32	2.13	1.220	↓	-1/4	↑	2.329	2.179	1.216	↓	-1/16	D	2.177	1.224	↓	-1/16
33	2.13	1.222	↓	-1/4	↑	2.323	2.185	1.216	↓	-1/16	D	2.173	1.221	↓	-1/16
34	2.14	1.220	↓	-1/16	↑	2.333	2.204	1.216	↓	-1/16	D	2.177	1.224	↓	-1/4
35	2.13	1.218	78	-1/4	↑	2.314	2.180	1.214	79	-1/8	D	2.178	1.221	77°	-1/4
36	2.14	1.218	↓	-1/8	↑	2.324	2.199	1.212	↓	O	D	2.189	1.212	↓	-1/16
37	2.13	1.218	↓	-1/4	↑	2.315	2.185	1.210	↓	-1/16	D	2.184	1.223	↓	O
38	2.13	1.213	↓	-1/4	↑	2.305	2.172	1.210	↓	-1/4	D	2.187	1.222	↓	-1/16
39	2.14	1.220	↓	-1/4	↑	2.320	2.197	1.216	↓	-1/4	D	2.193	1.228	↓	-1/16
40	2.14	1.220	75	-1/4	↑	2.332	2.195	1.216	79	-1/4	D	2.177	1.216	77°	O
41	2.13	1.216	↓	-1/4	↑	2.383	2.214	1.208	↓	-1/16	D	2.167	1.202	↓	O
42	2.14	1.222	↓	-1/4	↑	2.327	2.200	1.218	↓	-1/8	D	2.196	1.222	↓	-1/16
43	2.14	1.222	↓	-1/4	↑	2.320	2.200	1.212	↓	-1/4	D	2.152	1.213	↓	O
44	2.14	1.220	↓	-1/4	↑	2.322	2.202	1.214	↓	-1/16	D	2.152	1.209	↓	O
45	2.14	1.220	78	-1/8	↑	2.322	2.203	1.212	78	O	D	2.189	1.216	77°	O
46	2.13	1.212	↓	-1/4	↑	2.319	2.197	1.210	↓	O	D	2.205	1.217	↓	O
47	2.13	1.224	↓	-1/4	↑	2.317	2.183	1.214	↓	-1/4	D	2.207	1.220	↓	O
48	2.12	1.220	↓	-1/4	↑	2.315	2.191	1.214	↓	-1/4	D	2.180	1.218	↓	O
49	2.13	1.224	↓	-1/4	↑	2.307	2.191	1.222	↓	-1/4	D	2.198	1.220	↓	O
50	2.13	1.224	92	-1/8	↑	2.302	2.183	1.224	81	-1/4	D	2.177	1.216	77°	O
51	2.13	1.226	↓	-1/2	↑	2.323	2.195	1.218	↓	-1/4	D	2.187	1.220	↓	-1/4
52	2.12	1.224	↓	-1/4	↑	2.313	2.182	1.216	↓	-1/4	D	2.175	1.224	↓	O
53	2.12	1.224	↓	-1/4	↑	2.299	2.176	1.216	↓	-1/4	D	2.182	1.226	↓	O
54	2.13	1.212	↓	-1/4	↑	2.348	2.207	1.212	↓	-1/4	C	2.197	1.224	↓	O
55	2.12	1.210	95	-1/4	↑	2.324	2.199	1.210	84	-1/4	C	2.179	1.223	76°	O
56	2.12	1.214	↓	-1/8	↑	2.306	2.180	1.210	↓	-1/4	D	2.165	1.211	↓	O
57	2.12	1.218	↓	-1/4	↑	2.288	2.167	1.222	↓	-1/16	D	2.181	1.215	↓	O
58	2.13	1.225	↓	O	↑	2.294	2.182	1.216	↓	O	D	2.169	1.215	↓	O
59	2.13	1.220	↓	O	↑	2.309	2.197	1.215	↓	O	D	2.212	1.214	↓	O
60	2.13	1.220	95	O	O	2.300	2.185	1.210	85	O	D	2.151	1.211	77	O

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3409 2-3-15

ATTACHMENT 8.4
Page 4 of 6

BATTERY BANK B

	BEFORE TEST DATA				DURING CHARGE DATA		AFTER CHARGE DATA (DATE: 11-26-90)				PREVIOUS EXTENDED EQUALIZING AFTER CHARGE DATA (DATE: 3-7-90)			
	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Water Added	Cell Volts	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Bottom Color	Cell Volts	SP Gravity (Uncorr.)	Temp	Level
1	2.13	1.216	82	-1/4	N/A	2.325	2.159	1.214	83	-1/16	D	2.163	1.215	77°	0
2	2.14	1.216	↓	-3/16	↑	2.302	2.169	1.214	↓	-1/16	↑	2.178	1.215	↓	0
3	2.16	1.220		-1/4		2.319	2.182	1.222		-1/4		2.197	1.220		0
4	2.15	1.220		-3/16		2.430	2.194	1.222	↓	0		2.202	1.217		0
5	2.15	1.218	90	-1/4		2.323	2.190	1.214	93	-1/8		2.186	1.215	78°	+ 1/16
6	2.15	1.220	↓	-1/4		2.321	2.174	1.216	↓	-1/8		2.176	1.217	↓	0
7	2.16	1.224		-1/8		2.317	2.190	1.222		-1/4		2.188	1.224		0
8	2.15	1.220		-1/4		2.316	2.177	1.216		-1/4		2.189	1.215		- 1/8
9	2.14	1.214	↓	-1/4		2.315	2.158	1.212	↓	-1/4		2.169	1.213	↓	0
10	2.14	1.216	91	-1/4		2.317	2.161	1.214	81	-1/4		2.171	1.215	77°	0
11	2.14	1.216	↓	-1/4		2.317	2.170	1.216	↓	-1/8		2.161	1.214	↓	0
12	2.16	1.218		-1/8		2.316	2.191	1.216		-1/4		2.186	1.216		- 1/16
13	2.16	1.216		-1/4		2.324	2.187	1.212		-1/8		2.179	1.214	↓	0
14	2.14	1.210	↓	-1/4		2.335	2.166	1.212	↓	-1/16		2.171	1.208	78°	0
15	2.16	1.214	75	-1/4		2.316	2.192	1.213	79	-3/16		2.178	1.213		0
16	2.17	1.224	↓	-1/8		2.340	2.196	1.221	↓	-3/16		2.176	1.222	↓	- 3/16
17	2.14	1.214		-1/8		2.327	2.151	1.214		-1/4		2.154	1.212		- 1/16
18	2.15	1.212		-1/8		2.326	2.170	1.211		-1/16		2.168	1.212		0
19	2.16	1.214	↓	-3/16		2.332	2.220	1.212	↓	0		2.209	1.212	↓	+ 1/16
20	2.17	1.213	79	-1/16		2.340	2.198	1.210	79	0		2.186	1.211	78°	+ 1/16
21	2.14	1.214	↓	1/16		2.308	2.161	1.212	↓	-1/4		2.150	1.202	↓	0
22	2.17	1.216		-1/4		2.352	2.192	1.212		-1/16		2.173	1.214		- 1/16
23	2.15	1.216		-1/16		2.340	2.173	1.212		-1/8		2.158	1.213		0
24	2.14	1.212	↓	-1/16		2.345	2.181	1.212	↓	0		2.173	1.210	↓	0
25	2.17	1.216	77	-1/16		2.348	2.194	1.212	79	-1/4		2.177	1.213	79°	0
26	2.14	1.222	↓	-1/16		2.362	2.228	1.220	↓	0		2.225	1.219	↓	0
27	2.16	1.216		-1/4		2.346	2.190	1.210		-1/16		2.176	1.207		- 1/16
28	2.15	1.220		-1/8		2.372	2.231	1.216		-1/16		2.232	1.217		0
29	2.16	1.212	↓	-1/4		2.334	2.198	1.210	↓	-1/4	↓	2.206	1.211	↓	0
30	2.15	1.216	75	-1/4	N/A	2.272	2.175	1.216	79	-1/4	D	2.176	1.211	78°	0

BATTERY BANK B

	BEFORE TEST DATA				DURING CHARGE DATA	AFTER CHARGE DATA (DATE: 11-26-90)					PREVIOUS EXTENDED EQUALIZING AFTER CHARGE DATA (DATE: 3-7-90)			
	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Water Added	Cell Volts	Cell Volts	SP Gravity (Uncorr.)	Temp	Level	Bottom Color	Cell Volts	SP Gravity (Uncorr.)	Temp	Level
31	216	1.224		-1/4	N/A	2.370	2.194	1.220		-3/16	D	2.188	1.223	75	-3/16
32	2.17	1.216		-1/16		2.373	2.210	1.210		-1/16		2.225	1.210		0
33	2.14	1.220		-1/16		2.316	2.161	1.216		0		2.165	1.214		0
34	2.14	1.220		-1/4		2.306	2.159	1.213		-1/8		2.152	1.216		-1/16
35	2.15	1.220	77	-1/16		2.319	2.186	1.216	80	0		2.177	1.216	80	0
36	2.16	1.220		-1/16		2.313	2.194	1.214		-1/16		2.193	1.214		0
37	2.16	1.212		-1/4		2.364	2.196	1.212		-1/8		2.171	1.207		-1/16
38	2.16	1.222		-1/4		2.337	2.182	1.216		-1/16		2.164	1.216		-1/16
39	2.15	1.214		-3/16		2.315	2.178	1.212		-1/16		2.168	1.208		0
40	2.14	1.212	79	-3/16		2.314	2.162	1.212	80	-1/8		2.155	1.208	80	0
41	2.14	1.208		-1/8		2.318	2.180	1.208		0		2.187	1.209		0
42	2.14	1.212		-1/8		2.348	2.160	1.210		-1/16		2.156	1.208		0
43	2.17	1.222		-1/4		2.369	2.196	1.216		-1/8		2.211	1.217		0
44	2.16	1.220		-1/4		2.352	2.188	1.214		-1/16		2.174	1.214		0
45	2.15	1.220	78	-1/4		2.309	2.165	1.216	80	-1/4		2.160	1.214	80	-1/16
46	2.15	1.222		-1/4		2.342	2.169	1.216		-1/8		2.129	1.218		0
47	2.14	1.212		-3/16		2.344	2.167	1.210		-1/8		2.164	1.210		0
48	2.17	1.224		-3/8		2.351	2.194	1.220		-1/16		2.181	1.217		-1/8
49	2.16	1.224		-1/4		2.326	2.192	1.220		-1/16		2.194	1.222		-1/16
50	2.16	1.216	80	-1/16		2.357	2.195	1.214	81	-1/8		2.216	1.214	79	0
51	2.14	1.210		-1/8		2337	2.164	1.211		-1/16		2.152	1.206		0
52	2.16	1.220		-3/16		2.316	2.182	1.216		-1/8		2.176	1.214		0
53	2.16	1.212		-1/8		2.333	2.186	1.210		-1/16		2.195	1.210		0
54	2.13	1.212		-1/16		2.341	2.155	1.210		-1/8		2.164	1.208		0
55	2.17	1.220	79	-1/8		2.389	2.220	1.212	82	0		2.216	1.215	77	0
56	2.15	1.216		-1/4		2.319	2.173	1.214		-1/16		2.171	1.214		0
57	2.14	1.218		-1/16		2.346	2.162	1.210		0		2.168	1.214		0
58	2.15	1.214		0		2.325	2.204	1.214		0		2.218	1.213		+1/8
59	2.14	1.212		-1/4		2.304	2.155	1.212		-1/16		2.168	1.210		0
60	2.16	1.222	80	-1/8	N/A	2357	2.184	1.212	82	-1/8	D	2.185	1.214	77	0

Corrected copy
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DATA SHEET

Bank A DVM	Bank A MCC	Bank A Charger		Bank B DVM	Bank B MCC	Bank B Charger
* 130.2	130	130	Float Volts	130.8	131	131
138.5	138	138	Equal Volts	138.8	139	140
Date	Time			Date	Time	
11-13-90	1807		Charge Started	11-14-90	1214	
11-14-90 ~~11-13-90~~	*0007 ~~2407~~		Charge Stabilized	*11-14-90	*1714	
11-19-90	0917		Charge Completed	11-19-90	1214	

Pilot Cell (13) Time*	Current*	Temp*	Pilot Cell (47) Time*	Current*	Temp*
1907	260	86	1314	84.7	86
2007	120	87	1414	59.5	86
2107	50	87	1514	59.2	86
2207	49	87	1614	59.0	86
2307	48	87	1714	58.8	85
~~2407~~ 0007	48	87	1814	58.8	85

	Low Cell Volts		Low Cell Volts
T = 105*	T = 105*	2.242	2.319
T = 115*	T = 115*	N/A	2.320
T = 125*	T = 125*	N/A	N/A

Test Equipment Used	Serial No.	Model	Cal. Due Date
FLUKE DVM	4672281	8842A	3-20-91
HP DVM	2132A11150	3466A	2-22-91
KEITHLEY DVM	29111B	197	11-24-90

Performed By: ~~Roger Blackwell~~ 11-26-90

Reviewed By: [signature] I&C Foreman 11/27/90 Date

[signature] Maintenance Supervisor 12-19-90 Date

* SEE COMMENTS ON PAGE 19

TABLE I

DISCHARGE CURRENT CORRECTION FACTOR K FOR TEMPERATURE

°F	FACTOR K
62	1.098
63	1.092
64	1.086
65	1.080
66	1.072
67	1.062
68	1.056
69	1.048
70	1.040
71	1.034
72	1.029
73	1.023
74	1.017
75	1.011
76	1.006
77	1.000

°F	FACTOR K
78	0.994
79	0.987
80	0.980
81	0.976
82	0.972
83	0.968
84	0.964
85	0.960
86	0.956
87	0.952
88	0.948
89	0.944
90	0.940
91	0.938
92	0.936

BATTERY TEMPERATURE/LEVEL CORRECTION
TABLE II: SPECIFIC GRAVITY CORRECTIONS

The corrected specific gravity is the measured specific gravity corrected for both temperature and level, and normally rounded to 3 decimal places.

Corrected sp. gr. = Measured sp. gr. ± Temperature Correction ± Level Correction

L_{corr} T_{corr}

A. TEMPERATURE CORRECTION

Obtain the value of T_{corr} for the electrolyte temperature (measured to the nearest degree F) from the table below. Add or subtract (as shown by the "+" or "-") T_{corr} from the measured specific gravity.

°F	T_{corr}	°F	T_{corr}	°F	T_{corr}	°F	T_{corr}	°F	T_{corr}
100	+.0069	90	+.0039	80	+.0009	70	-.0021	60	-.0051
99	+.0066	89	+.0036	79	+.0006	69	-.0024	59	-.0054
98	+.0063	88	+.0033	78	+.0003	68	-.0027	58	-.0057
97	+.0060	87	+.0030	77	0000	67	-.0030	57	-.0060
96	+.0057	86	+.0027	76	-.0003	66	-.0033	56	-.0063
95	+.0054	85	+.0024	75	-.0006	65	-.0036	55	-.0066
94	+.0051	84	+.0021	74	-.0009	64	-.0039	54	-.0069
93	+.0048	83	+.0018	73	-.0012	63	-.0042	53	-.0072
92	+.0045	82	+.0015	72	-.0015	62	-.0045	52	-.0075
91	+.0042	81	+.0012	71	-.0018	61	-.0048	51	-.0078

B. LEVEL CORRECTION

Obtain the value of L_{corr} for the electrolyte level (measured to the nearest 1/16 inch) from the table below. Add or subtract (as shown by the "+" or "-") L_{corr} from the measured specific gravity.

Level	L_{corr}	Level	L_{corr}	Level	L_{corr}	Level	L_{corr}
+1/4	+.0060	-1/8	-.0030	-7/16	-.0105	-3/4	-.0180
+3/16	+.0045	-3/16	-.0045	-1/2	-.0120	-13/16	-.0195
+1/8	+.0030	-1/4	-.0060	-9/16	-.0135	-7/8	-.0210
+1/16	+.0015	-5/16	-.0075	-5/8	-.0150	-15/16	-.0225
0	.0000	-3/8	-.0090	-11/16	-.0165	-1	-.0240
-1/16	-.0015						

TABLE III

BATTERY LOAD PROFILE

A BATTERY		
TIME	AMPS	CORRECTED AMPS
1 MIN	~~358~~ 407	417
58 MIN	~~287~~ 328	336
1 MIN	~~319~~ 363	372
Calculation ID: 7988-E3 Rev. 3		

REQUIRED TIME: 1 HOUR

B BATTERY		
TIME	AMPS	CORRECTED AMPS
1 MIN	~~213~~ 231	234.0
58 MIN	~~113~~ 123	124.6
1 MIN	~~145~~ 157	159.1
Calculation ID: 7988-E1 Rev. 4		

REQUIRED TIME: 1 HOUR

3409 2320

ADDENDUM TO MST-921, STATION BATTERY SERVICE TEST

During the performance of MST-921 on 11/13/90, the 'A' Battery discharge test was interrupted at the three minute mark. The delay lasted approximately 8 minutes, at which time the test was continued.

The cause of this interruption was the failure of the load test computer. The function of the load test computer is to monitor all individual cell voltages (ICV's), provide a printout of these ICV's when requested, and to act as the test clock. Therefore, when the computer was lost, no means of determining cell voltage was available other than manually with a voltmeter. This was unacceptable, since knowledge of cell performance is important in preventing potential cell damage if a reversal occurs. The computer was reset after 8 minutes, with no apparent reason found for the initial failure.

At the time of the computer failure, 'A' Battery terminal voltage was observed to be 115.9 VDC with a discharge rate of 336 amps. When the test was restarted at the same discharge rate, terminal voltage was 116.2 VDC. At this time, I decided to continue the discharge at 336 amps, but to not restart the clock until terminal voltage reached 115.9 VDC. This took approximately 7 minutes. The clock was restarted and no other problems were encountered during the remainder of the test, with a final terminal voltage of 112.4 VDC.

The effect of this delay was felt in two ways. First, the delay gave the battery time to recover. However, when the discharge was restarted, the test clock was held at three minutes until the terminal voltage was at the value when test was suspended. The end result had equal or more amp-hours being discharged from 'A' Battery than would have been with no delay.

In conclusion, the interruption of 'A' Battery's service test provided an equal or greater test of its capacity than that of a continuous one hour discharge.

Dave Tolman
DC System Engineer

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TORQUE WRENCH CERTIFICATE OF CALIBRATION

TORQUE WRENCH

TOOL IDENTIFICATION NO.	MODEL NO.	SERIAL NO.
N/A	6064-5	109276

TORQUE WRENCH TESTER

TOOL IDENTIFICATION NO.	MODEL NO.	SERIAL NO.
N/A	Tester IBT600 Transducer FAT100	Tester 38657 Transducer 1027

CALIBRATION DATE 10-11-90 AND IS TRACEABLE TO THE NATIONAL BUREAU OF STAND

BEFORE USE READINGS ☑ IN - LBS ☐ FT - LBS

TESTER READING CLOCKWISE	TORQUE WRENCH SETTING	TESTER READING COUNTER CLOCKWISE
88.6	90	
98.2	100	
141.5	140	
154.8	150	

VERIFIED BY Donald Pruitt DATE 11-13-90

AFTER USE READINGS ☑ IN - LBS ☐ FT - LBS

TESTER READING CLOCKWISE	TORQUE WRENCH SETTING	TESTER READING COUNTER CLOCKWISE
88.8	90	
99.2	100	
140.2	140	
151.1	150	

CALIBRATION OF THE ABOVE LISTED TORQUE WRENCH VERIFIED AFTER USE AND FOUND TO BE:

☑ WITHIN TOLERANCE ☐ OUT - OF - TOLERANCE

VERIFIED BY Doug Moser DATE 11/15/90

JOB NO./TITLE 87-ALL

ITEM/LOCATION (COMPLETE DESCRIPTION) MST-921 "B" Bank Batteries "A" BANK Batteries

R. Blackwell

36 REVIEWED BY Gene Tuck

3409 23222

GENERAL ELECTRIC COMPANY

GE COMPUTER SERVICE
ELECTRONIC SERVICES
105 TWIN OAKS DRIVE
SYRACUSE , NY 13206

Issued To:
BATTERY RES TESTING
R.D. #2
MEXICO, NY 13114

JOB # 42090-003

Certificate

Calibrated: 03/21/90
Recall due in 12 Month(s).

Purchase Order: PJD0320
Manufacturer: BIDDLE, J.G.
Model: 247001-11
Description: DIG LOW RES OHMMETER
Serial No: 21463

Calibrated By: KEITH A DEVLIN
Conditions: 75.0 Degrees Fahrenheit
39.0 % Relative Humidity
Cal Procedure : 09M BID 247000 SERIE
Equipment in Calibration as Received: YES

NIST TEST REPORT NUMBERS
DC Voltage: 00242960
AC Voltage: 00234625
Resistance: 00240543
Capacitance: 00237986
Inductance: 00237731
Frequency: WWVB

Remarks:
SEE ATTACHED DATA FOR BEFORE AND AFTER READINGS.

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology(NIST). Evidence of traceability is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard and the item calibrated has been maintained.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APP B, NORTHEAST REGION QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
ST1199	LN-4223	547401	12	03/13/91
ST1198	LN-4222	536567	12	03/13/91
ST1197	LN-4221	536572	12	03/13/91
ST1193	LN-4025	613075	12	03/13/91
ST1192	LN-4020	558057	12	03/13/91

Approved By: _____
NEIL J DENNY
QUALITY REPRESENTATIVE
GENERAL ELECTRIC

Continued on Page 2

GENERAL ELECTRIC COMPANY

GE COMPUTER SERVICE
ELECTRONIC SERVICES
105 TWIN OAKS DRIVE
SYRACUSE , NY 13206

Issued To:
BATTERY RES TESTING
R.D. #2

MEXICO, NY 13114

JOB # 42090-007
CAP # 177822

Certificate

Calibrated: 03/21/90
Recall due in 12 Month(s).

Purchase Order: PJD0320
Manufacturer: BECKMAN
Model: CT233
Description: AC/DC CLAMP-ON
Serial No: NSN

Calibrated By: KEITH A DEVLIN
Conditions: 75.0 Degrees Fahrenheit
39.0 % Relative Humidity
Cal Procedure : 09M BEK CT-233
Equipment in Calibration as Received: YES

NIST TEST REPORT NUMBERS
DC Voltage: 00242960
AC Voltage: 00234625
Resistance: 00240543
Capacitance: 00237986
Inductance: 00237731
Frequency: WWVB

Remarks:
CALIBRATED AS A SYSTEM WITH BECKMAN HD-100 DMM S/N 90417673 (CALIBRATED PRIOR TO USE). SEE ATTACHED DATA FOR BEFORE AND AFTER READINGS. REPLACED BATTERY - READINGS NOT EFFECTED.

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology(NIST). Evidence of traceability is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard and the item calibrated has been maintained.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APP B, NORTHEAST REGION QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
ST1100	FLU-5100B	2715005	06	08/24/90
ST1274	VHA-2555A	15 1059	06	04/06/90
ST1108	TEK-DC504	B033501	06	06/05/90

Approved By:
NEIL J DENNY
QUALITY REPRESENTATIVE
GENERAL ELECTRIC

Continued on Page 2

GENERAL ELECTRIC COMPANY

GE COMPUTER SERVICE
ELECTRONIC SERVICES
105 TWIN OAKS DRIVE
SYRACUSE , NY 13206

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R.D. #2

MEXICO, NY 13114

JOB # 42090-005

Certificate

Calibrated: 03/21/90
Recall due in 12 Month(s).

Purchase Order: PJD0320
Manufacturer: BECKMAN
Model: HD100
Description: DMM
Serial No: 81117192

NIST TEST REPORT NUMBERS
DC Voltage: 00242960
AC Voltage: 00234625
Resistance: 00240543
Capacitance: 00237986
Inductance: 00237731
Frequency: WWVB

Calibrated By: BOB KIMBALL
Conditions: 75.0 Degrees Fahrenheit
39.0 % Relative Humidity
Cal Procedure : 09M BEK HD100 10/82
Equipment in Calibration as Received: YES

Remarks:
SEE ATTACHED DATA FOR BEFORE AND AFTER READINGS.

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology(NIST). Evidence of traceability is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard and the item calibrated has been maintained.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APP B, NORTHEAST REGION QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
ST1046	FLU-5101A	2026023	06	06/21/90
ST1301	FLU-8024B	3151009	06	08/07/90

Approved By: _____
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SYRACUSE , NY 13206

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R.D. #2

MEXICO, NY 13114

JOB # 42090-004

Certificate

Calibrated: 03/21/90
Recall due in 12 Month(s).

Purchase Order: PJD0320
Manufacturer: BECKMAN
Model: HD100
Description: DMM
Serial No: 30823034

Calibrated By: BOB KIMBALL
Conditions: 75.0 Degrees Fahrenheit
39.0 % Relative Humidity
Cal Procedure : 09M BEK HD100 10/82
Equipment in Calibration as Received: YES

NIST TEST REPORT NUMBERS
DC Voltage: 00242960
AC Voltage: 00234625
Resistance: 00240543
Capacitance: 00237986
Inductance: 00237731
Frequency: WWVB

Remarks:
SEE ATTACHED DATA FOR BEFORE AND AFTER READINGS. REPLACED WEAK BATTERY - READINGS NOT EFFECTED.

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology(NIST). Evidence of traceability is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard and the item calibrated has been maintained.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APP B, NORTHEAST REGION QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
ST1046	FLU-5101A	2026023	06	06/21/90
ST1301	FLU-8024B	3151009	06	08/07/90

Approved By:
NEIL J DENNY
QUALITY REPRESENTATIVE
GENERAL ELECTRIC

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GE COMPUTER SERVICE
ELECTRONIC SERVICES
105 TWIN OAKS DRIVE
SYRACUSE , NY 13206

Issued To:
BATTERY RES TESTING
R.D. #2

MEXICO, NY 13114

JOB # 42151-001 **Certificate** Calibrated: 04/03/90
Recall due in 12 Month(s).

Purchase Order:
Manufacturer: BECKMAN
Model: HD100
Description: DMM
Serial No: 90417671

Calibrated By: BOB KIMBALL
Conditions: 76.0 Degrees Fahrenheit
40.0 % Relative Humidity
Cal Procedure : 09M BEK HD100 10/82
Equipment in Calibration as Received: YES

NIST TEST REPORT NUMBERS
DC Voltage: 00242960
AC Voltage: 00234625
Resistance: 00240543
Capacitance: 00237986
Inductance: 00237731
Frequency: WWVB

Remarks:
SEE ATTACHED DATA FOR BEFORE AND AFTER READINGS.

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology(NIST). Evidence of traceability is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard and the item calibrated has been maintained.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED. ALL CURRENT NIST TEST REPORT NUMBERS ARE ON FILE AT OUR METROLOGY LAB.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APP B, NORTHEAST REGION QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
ST1046	FLU-5101A	2026023	06	06/21/90

Approved By: _____
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105 TWIN OAKS DRIVE
SYRACUSE , NY 13206

Issued To:
BATTERY RES TESTING
R.D. #2

MEXICO, NY 13114

JOB # 42090-001
CAP # 166350

Certificate

Calibrated: 03/21/90
Recall due in 12 Month(s).

Purchase Order: PJD0320
Manufacturer: ALBER
Model: BCT-30
Description: BATTERY CAPACITY TEST SYS
Serial No: ECU16-6350

Calibrated By: KEITH A DEVLIN
Conditions: 73.0 Degrees Fahrenheit
40.0 % Relative Humidity
Cal Procedure : 09M ALB BCT-30
Equipment in Calibration as Received: YES

NIST TEST REPORT NUMBERS
DC Voltage: 00242960
AC Voltage: 00234625
Resistance: 00240543
Capacitance: 00237986
Inductance: 00237731
Frequency: WWVB

Remarks:
SEE ATTACHED DATA FOR BEFORE AND AFTER READINGS. REPLACED BROKEN FUSE HOLDER AFTER INITIAL READINGS.

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology(NIST). Evidence of traceability is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard and the item calibrated has been maintained.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APP B, NORTHEAST REGION QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
S11100	FLU-5100B	2715005	06	08/24/90

Approved By:
NEIL J DENNY
QUALITY REPRESENTATIVE
GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY

GE COMPUTER SERVICE
ELECTRONIC SERVICES
105 TWIN OAKS DRIVE
SYRACUSE , NY 13206

Issued To:
BATTERY RES TESTING
R.D. #2

MEXICO, NY 13114

JOB # 43492-001
CAP # 166349

Certificate

Calibrated: 09/21/90
Recall due in 12 Month(s).

Purchase Order:
Manufacturer: EMPRO
Model: 1000AMP
Description: 100MN SHUNT
Serial No: B1000-100

Calibrated By: KEITH A DEVLIN
Conditions: 72.0 Degrees Fahrenheit
40.0 % Relative Humidity
Cal Procedure : 09M GE 591.2.66
Equipment in Calibration as Received: YES

NIST TEST REPORT NUMBERS
DC Voltage: 242960
AC Voltage: 234625
Resistance: 245413
Capacitance: 243620
Inductance: 242603
Frequency: WWVB

Remarks:
0.0001002 OHMS @ 100A

This Certificate attests that this instrument has been calibrated under the stated conditions with standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards used have been calibrated to their manufacturer's specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at our Metrology Laboratory. An acceptable accuracy ratio between the standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturers published specifications unless noted.

THE ACCURACY RATIO MAINTAINED IS AT LEAST 4:1 UNLESS OTHERWISE STATED. ALL CURRENT NIST TEST REPORT NUMBERS ARE ON FILE AT OUR METROLOGY LAB.

THIS CALIBRATION COMPLIES WITH MIL-STD-45662A AND/OR 10CFR50 APPENDIX B, SECTION XII GECS QA MANUAL AND CUSTOMER'S REQUIREMENTS.

* * * * * * * * * STANDARD(S) USED IN CALIBRATION * * * * * * * * *

CAP NO	MANUFACTURER-MODEL	SERIAL NUMBER	INT	DUE DATE
ST1100	FLU-5100B	2715005	06	02/21/91

GECS 1 SYR

Approved By: _____
NEIL J DENNY
QUALITY REPRESENTATIVE

Continued on Page 2

GENERAL ELECTRIC

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1 MIN — 231 AMPS ÷ .987 = 234.0

1 - 59 MIN — 123 AMPS ÷ .987 = 124.6

59 - 60 MIN — 157 AMPS ÷ .987 = 159.1

CAPACITY TEST REPORT

location Robinson Nuclear Plant
btry # Battery "B"
test date 11/13/90

mfg./model GNB - NCX-23
# of cells 60
btry. type Ni-Cad

BATTERY INSTALLATION DATE ********** 11/79 UNK.

MANUFACTURER'S RATED CAPACITY ********** 170 AMPS @ 1 HRS/~~MIN~~.

AVERAGE ELECTROLYTE TEMP. ********** 79 F.

CORRECTION FACTOR FOR ELECTROLYTE TEMP. **** .967

ACTUAL CORRECTED DISCHARGE RATE ********** ~~X~~ AMPS @ ___ HRS/MIN.

PROGRAMMED TEST DURATION ********** 1 HRS/~~MIN~~.

PROGRAMMED LOW VOLTAGE CELL ALARM ********** 1.75

PROGRAMMED BATTERY LOW VOLTAGE TEST CUT-OFF AT START OF TEST ********** ~~105~~ 106 VOLTS

FIRST CELL(S) TO REACH TERMINAL VOLTAGE **** N/A V/A

FIRST CELL(S) REACHED TERMINAL VOLTAGE AT ** N/A ~~MIN~~.

ELAPSED TEST TIME ********** 61 ~~HRS~~/MIN.

OVERALL VOLTAGE AT END OF TEST ********** 112.3 VOLTS

REASON FOR TEST TERMINATION ********** ~~TERM. V. /BTRY FAIL~~ PROCEDURE CHANGED FOR 60 MIN CAP TEST

PERCENT OF RATED CAPACITY AT TEST RATE ***** N/A %

POST TEMP. ROSE DURING THE TEST TO ********* 82° F.

BATTERY RESEARCH REP. ********** Bill Anscis

CUSTOMER REP. ********** Dave Tinnin

The first cell(s) to reach 1.75/_____ volts was/were cell number(s) _____ at _____ minutes. The remainder of the cells fell evenly and the test was terminated at _____ minutes with a voltage of _____ volts.

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		Temp	Correction	Actual
0-1	407	81°	0.976 –	~~417.07~~ 417
1-59	328	81°	0.976 –	~~336.07~~ 336
59-60	363	81°	0.976 –	~~371.92~~ 372

0 - 1 - 417
1 - 59 - 336
59 - 60 - 372

CAPACITY TEST REPORT

location Robinson Unit #2
btry # "A"
test date 11/13/90

mfg./model GNB NCX-1050
# of cells 60
btry. type LA-Calcium

BATTERY INSTALLATION DATE ..... 11/79 UNK.

MANUFACTURER'S RATED CAPACITY ..... 525 AMPS @ 1 HRS/~~MIN~~.

AVERAGE ELECTROLYTE TEMP. ..... 81° F.

CORRECTION FACTOR FOR ELECTROLYTE TEMP. 0.976

ACTUAL CORRECTED DISCHARGE RATE ..... AMPS @ 1 HRS/~~MIN~~.

PROGRAMMED TEST DURATION ..... 65 ~~HRS~~/MIN.

PROGRAMMED LOW VOLTAGE CELL ALARM 1.75

PROGRAMMED BATTERY LOW VOLTAGE TEST CUT-OFF AT START OF TEST ..... 107 VOLTS

FIRST CELL(S) TO REACH TERMINAL VOLTAGE .... N/A

FIRST CELL(S) REACHED TERMINAL VOLTAGE AT .. N/A MIN.

ELAPSED TEST TIME ..... 60 ~~HRS~~/MIN.

OVERALL VOLTAGE AT END OF TEST ..... 112.4 VOLTS

REASON FOR TEST TERMINATION ..... ~~TERM. V./BTRY. FAIL~~ PROCEDURE CALLED FOR 60 MIN STEP TEST

PERCENT OF RATED CAPACITY AT TEST RATE ..... N/A %

POST TEMP. ROSE DURING THE TEST TO ..... 83° F.

BATTERY RESEARCH REP. ..... Bill Riedic

CUSTOMER REP. ..... Roger Blackwell / Dave Tolman

The first cell(s) to reach 1.75/ / volts was/were cell number(s) / at / minutes. The remainder of the cells fell evenly and the test was terminated at / / minutes with a voltage of / volts.

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Form 244

CP&L

Carolina Power & Light Company

Company Correspondence

File: R89-138/00-DE-A543

NED-R-5257

MEMORANDUM TO: Mr. A. M. McCauley

FROM: G. E. Attarian

SUBJECT: 125 Volt DC Emergency Battery - Service Test

REFERENCES:
1. Calculation 7988-E3 Rev 3, "125 V DC Battery Load Profile A"
2. Calculation 7988-E1 Rev 4, "125 V DC Battery Load Profile B"
3. Calculation 7988-E4 Rev 3, "DC Voltage profile"
4. Engineering Evaluation EE-107-CS-11, Rev. 2 "1990 Outage Modification Proposed DC Electrical Distribution System Changes"
5. Memorandum NED-R-4483 dated May 2, 1990.

While reviewing the data for the service tests conducted during RFO # 13, a minor discrepancy between the test currents used and those transmitted via Reference 5 was noticed.

The discrepancy is due to rounding off of the last digit of profile current (inclusive of design margin) to the nearest whole number based on preliminary information telecopied by NED. Final issue of Memorandum (Ref. 5) rounded off the last digit to the next higher whole number.

The Load Profiles as used in service tests are acceptable since the profiles include design margins (1.1 for Battery A & 1.08 for Battery B). Therefore, the profiles used in the tests adequately envelope the actual connected load profile including load changes completed during RFO # 13.

A Summary of Load Profiles is attached (Attachment A, Page A1; Tables 1 & 2).

The test documentation should also reference the Engineering Evaluation EE-107-CS-11, Rev 2 for source of Test Profiles.

This memorandum documents the acceptability of load profiles used in the service tests during RFO # 13 and supersedes Memorandum NED-R-4483 dated May 2, 1990 (Ref. 5).

SG/slb

Attachment

cc: Mr. B. M. Hynds
Mr. A. M. Lucas
Mr. M. D. Macon
Mr. R. M. Parsons
Mr. D. M. Tolman

TABLE 1

LOAD PROFILES PER EE-107-CS-11, REV.2

PROFILE TIME IN MINUTES (1)	BATTERY A (AMPS @ 77°F)			BATTERY B (AMPS @ 77°F)		
	LOAD (2)	DESIGN MARGIN (3)	DESIGN PROFILE (4)=(2)X(3)	LOAD (5)	DESIGN MARGIN (6)	DESIGN PROFILE (7)=(5)X(6)
1 MINUTE	369.6	1.1	406.56	214	1.08	231.12
58 MINUTES	298.2	1.1	328.02	113.6	1.08	122.688
1 MINUTE	330.2	1.1	363.22	145.6	1.08	157.248

TABLE 2

LOAD PROFILES FOR SERVICE TEST

PROFILE TIME IN MINUTES	BATTERY A (AMPS @ 77°F)			BATTERY B (AMPS @ 77°F)		
	PER NED-4483	ACTUAL USED IN TEST	NOTES*	PER NED-4483	ACTUAL USED IN TEST	NOTES*
1 MINUTE	407	407	ACCEPTABLE	232	231	ACCEPTABLE
58 MINUTES	329	328	ACCEPTABLE	123	123	ACCEPTABLE
1 MINUTE	364	363	ACCEPTABLE	158	157	ACCEPTABLE

* The test current values are considered acceptable if the difference is only due to rounding off of last digit to a whole number (after applying the Design Margin).