7.4 Refer to Attachment 4 to determine proper safety equipment required.

7.5 Verify procedure 2403.024 has been performed prior to performance of this procedure and attach a copy of the following completed portions of that procedure:

7.5.1 Battery Bank over-all voltage, step 8.1.1.E.

7.5.2 Data Sheet One (1)

7.5.3 Data Sheet Two (2)

7.5.4 Data Sheet Three (3) 5/17/97

7.6 Verify that the Quality Control Inspection Supervisor has been notified that work is about to begin since this procedure contains QC Hold Points. JAL 5-17-97

7.7 Verify that battery 2D11 is on normal float charge and has not been on an equalize charge for 72 hours prior to performing this surveillance. JAL 5-17-97

7.8 Verify that the Unit 2 Operations Shift Superintendent has been notified that the work is ready to start and that his authorization has been given. JAL 5-17-97

7.9 Perform pre-test check of torque wrenches on Torque Tester and record the following:

Equip. No. IT-018 Cal. Due Date 10/14/97

Equip. No. TW-705 Cal. Due Date 8/5/97 JAL 5-17-97

8.0 INSTRUCTIONS

8.1 PERFORMANCE DISCHARGE TEST SET UP.

8.1.1 Removal of 2D11 from service:

A. Verify Charger 2D31 or alternate is powered up and supplying power for Bus 2D01. JAL 5-17-97

B. Obtain assistance from Operations to aid with the removal of 2D11 from service. JAL 5-17-97

C. Open the battery disconnect switch, 2D51 JAL 5-17-97

WARNING

The 2D01 side of the fuse connections are energized. Avoid contact when removing the fuses.

8.1.2 Remove the 1800 amp fuses. JAL 15-17-97

WARNING

The Battery side of the fuse connections are energized. Avoid contact when removing the fuses.

8.1.3 Remove the pin indicating fuses from 2D41. JAL 15-17-97

8.1.4 Verify that Handswitch AS1 on 2D41 is in the "NORMAL" position. JAL 15-17-97

WARNING

The 2D01 side of the fuse connections are energized. Avoid contact when bolting cables from test load device.

8.1.5 Bolt the cables from the test load device to the battery side of the 1800 amp fuse connector. JAL 15-17-97

NOTE

This section is to determine the condition of battery connections before the performance discharge test. No repair is to be effected if a high resistance reading is noted. This connection or connections must be watched during the discharge test for excessive heating.

QC HOLD

A QC inspector must be present to witness the reading of the battery connection resistances and sign Data Sheet 1 upon completion.

NOTE

A second person shall verify micro-ohm readings as they are being recorded on Data Sheet 1 and sign Data Sheet 1 upon completion.

8.1.6 Measure the cell-to-cell and terminal connection resistance to the nearest micro-ohm as directed below:

NOTE

The DLRO's battery test meter will indicate the relative state of charge of the DLRO battery.

A. Check the DLRO display and measuring circuit batteries. JAH 5.17.97

B. IF the DLRO's batteries are low, THEN connect the charger to the unit. IF the batteries are OK, THEN mark this step N/A. JAH 5.17.97

C. Separate the two sets of test leads and connect the DLRO as follows:

1. Connect the black lead wire of the first set, (marked "C") to the terminal marked "C1". JAH 5.17.97

2. Connect the red lead wire of the first set, (marked "P") to the terminal marked "P1". JAH 5.17.97

3. Connect the black lead wire of the second set, (marked "C") to the terminal marked "C2". JAH 5.17.97

4. Connect the red lead wire of the second set, (Marked "P") to the terminal marked "P2". JAH 5.17.97

NOTE

The user should select the lowest range possible on the DLRO that is greater than 150 micro-ohms, this will ensure that they are measuring micro-ohms to the right of the decimal point.

D. Set the DLRO to the lowest possible resistance range, that is greater than 150 micro-ohms. JAH 5.17.97

E. Turn the ON/OFF switch to the "ON" (lock) position JAH 5.17.97

NOTE

Each of the two test probes has the letter "P" on one face. This side of each probe should be in the same orientation to one another (i.e., if the "P" on one probe is facing inside, the "P" on the other probe should also face inside).

CAUTION

The probes should not be placed across a voltage source! The test probes should not be connected to a positive and negative posts of the same cell.

NOTE

In the step below, the statement "connect the test probes to the left most..." is an attempt to explain the measuring technique to you the user. It is not an instruction or limitation implying that you must begin at the left-most cell or that you cannot begin with cell number 1, beginning with the bus cable connection. Connections may be measured in any sequence so long as each connection on Data Sheet 3 is tested.

NOTE

The micro-ohm test for the intercell strap and cable connections should be measured from: battery post to battery post, battery post to terminal plate, and terminal plate to all cable terminal lugs.

F. Repeat the following steps 1 through 4 for all battery terminal to battery terminal, battery terminal to terminal plate and terminal plate to terminal lugs and record the "As Found" micro-ohm readings on data sheet 1.

ACCEPTANCE CRITERION

IF any recorded "As Found" reading in the following steps exceeds the Technical Specification allowable value of 150 micro-ohms,
THEN initiate a Condition Report and have the Cognizant Supervisor and/or the Maintenance Engineer perform an evaluation to determine if it is safe to proceed with the Service Discharge Test.

1. IF any single "As Found" reading obtained in the following steps is questionable (too high exceeding 150 micro-ohms),
THEN move the "Forward/Reverse" lever to "Reverse" and average the two readings.
IF average of the two readings is acceptable,
THEN proceed with remainder of test.
IF average of two readings is still questionable,
THEN initiate a Condition Report and have the Cognizant Supervisor and/or Maintenance Engineer perform an evaluation to determine if it is safe to proceed with the Service Discharge Test,

2. For battery terminal to battery terminal connections:

   a. Connect the probes to the left-most positive post (P1) of one cell and the left-most negative post (N1) of the adjacent cell. Obtain reading and record on data sheet 1.

   b. Connect the probes to the next left-most positive post (P2) and to the next left-most negative post (N2) of adjacent cell. Obtain reading and record on data sheet 1.

3. For battery terminal to terminal plate connections:

   a. IF testing positive posts to terminal plate, THEN connect the probes to the left-most positive post (P1) of cell and the terminal plate.
   THEN connect the probes to the next positive post (P2) of same cell and the terminal plate. Obtain reading and record on data sheet 1.

   b. IF testing negative posts to terminal plate, THEN connect the probes to the left-most negative post (N1) of cell and the terminal plate.
   THEN connect the probes to the next negative post (N2) of same cell and the terminal plate. Obtain reading and record on data sheet 1.

4. For terminal plate to wire terminal lug connections, connect the probes to the plate and each wire lug connected to the plate. Perform this step for each lug listed on data sheet, obtain readings and record on data sheet 1.

8.2 MEASURING CELL TEMPERATURE

8.2.1 Measure the cell temperature of each individual cell as listed on Attachment 1.

CAUTION

Use extreme caution when inserting and removing the thermometer from the sampling tube to avoid breaking the thermometer. If breakage occurs and parts of the thermometer remain in the battery, the Electrical Maintenance Supervisor should be notified as soon as possible.

NOTE

IF the front sample tube is bent or broken,
THEN the thermometer may be placed in the rear sample tube.

NOTE

A second person shall observe, sign and verify after completion, that steps A through C have been completed for all cells listed on Attachment 1 and this value recorded.

NOTE

Repeat steps 8.2.1.A through 8.2.1.C until all of the cells listed on Attachment 1 been measured.

A. Place the thermometer in the sample tube of the individual cell being measured. Thermometer should rest on the upper sample tube housing.

B. Leaving the thermometer in the cell being measured for 15 seconds will allow the reading to stabilize.

C. Record the temperature to the nearest °F for each cell on Attachment 1.

SECOND PERSON VERIFIER

An Second Person Verifier shall verify here and on Attachment 1 that temperature values were properly recorded in step 8.2.1.C for all cells.

Jim Hyman 15-12-97
Second Person Verifier Date

D. IF any of the monitored cells have bent or broken sample tubes, or broken thermometer parts in the cell,
THEN record the cell number in the space provided below, and notify the Electrical Maintenance Supervisor;
IF NOT,
THEN mark this step N/A.

Supervisor Remarks:

N/A /

E. IF any cell temperature deviates more than 3°C (5°F) from the other cells during inspection,
THEN notify the Electrical Maintenance Supervisor;
IF NOT,
THEN mark this step N/A.

Supervisor Remarks:

N/A /

F. Calculate and record on Attachment 1 the average cell temperature of the monitored cells listed on Attachment 1. Jr 15/17/97

8.3 BATTERY PERFORMANCE DISCHARGE TEST

8.3.1 Connect any remaining battery load test set control wiring needed for load monitoring or control. Jr 15/17/97

8.3.2 Determine and record below the discharge current correction factor (K Factor) based upon the average cell temperature obtained in Step 8.2.1 and the Table on Attachment 1. Jr 15/17/97

(K Factor) Discharge Current Correction Factor: .972 Jr 15/17/97

SECOND PERSON VERIFIER

A Second Person Verifier shall determine and record below the discharge current correction factor (K Factor) based upon the average cell temperature obtained in Step 8.2.1 and the Table on Attachment 1.

(K Factor) Discharge Current Correction Factor: .972

Second Person Verifier 15-17 97 Date

8.3.3 Calculate the actual discharge current by dividing 258 by the K Factor from Step 8.3.2.

258 amps Rated discharge current ÷ .972 K Factor = 251 Actual discharge current

258 Amps (K) = 251 Amps

JK 15/17/97

SECOND PERSON VERIFIER

A Second Person Verifier is to calculate the actual discharge current by dividing 258 by the K Factor from Step 8.3.2 and record below.

See CR 2-97-0444 Disch. Current Should HAVE Been 265 Amps Geo. Hall 7/3/97

258 amps Rated discharge current ÷ .972 K Factor = 251 Actual discharge current

258 Amps (K) = 251 Amps D. Hamilton 15-17-97
Second Person Verifier Date

8.3.4 Set up the load tester to 251 amps calculated in Steps 8.3.3 and 9 hours of discharge. ~~JAH 15-17-97~~ JAH 5-17-97 JH/5-17-97

SECOND PERSON VERIFIER

A Second Person Verifier shall verify that the load tester is set up correctly for a 9 hour discharge at the current value calculated in Step 8.3.3.

Jim Hamm 15-17-97
Second Person Verifier Date

8.3.5 Cognizant Supervisor shall verify calculations are correct and has granted permission to start the test.

JAH Per telecon
Mark Thorton 15-17-97
Cognizant Supervisor Date

8.3.6 Close 2D51 disconnect switch. JAH 15-17-97

8.3.7 Start the discharge test. JAH 15-17-97

8.3.8 Record the Start time on Data Sheet 2 and Attachment 3.

8.3.9 Adjust and maintain current throughout the test to the calculated value + 1% of setpoint, + 1 Amp. (i.e., Displayed Value may vary from setpoint by + 1%, then an additional + 1 Amp.) JH 15-17-97

NOTE

Extra data may be taken and attached for the following test. The discharge rate and the battery voltage should be monitored from start to stop.

NOTE

The print out from the Albers unit may be attached to this procedure to accompany the following step.

8.3.10 Monitor and record the discharge rate and the battery voltage at intervals established in Data Sheet 2.

8.3.11 IF the discharge is stopped for any reason other than a low voltage cell,
THEN record the stop and restart times below;
IF NOT,
THEN mark this step N/A. N/A

Stop time_____ Restart time_____

Reason for discharge stop_____
_____
_____

8.3.12 IF an individual cell or cells are approaching 1.0 volts,
THEN record the cell(s) number below and notify the Cognizant Supervisor immediately, continue the test closely monitoring the cell voltage to verify that no cell goes below 0.75 VDC;
IF NOT,
THEN mark this step N/A:

Cell number:_____ Volts:_____
Cell number:_____ Volts:_____
Cell number:_____ Volts:_____ N/A

8.3.13 IF at any time during the test a cell(s) voltage drops below 0.75 VDC,
THEN stop the discharge immediately, contact the Cognizant Supervisor and record the stop time below and on Attachment 3, and go to Attachment 2;
If NOT,
THEN mark this step N/A:

Discharge Stop Time:_____ N/A

NOTE

The final readings need to be rapidly taken as the decaying overall battery voltage approaches and goes below the 105 VDC voltage level.

8.3.14 Read the individual cell voltages and battery terminal voltage (rapidly) when the battery approaches 105 VDC, and record below and in the last column of Data Sheet 2.

Final Battery readings recorded: 106.8 VDC. R.H 5-17-97

8.3.15 Decrease the test load to "0" when the overall battery voltage is 105 VDC. N/A / JWB * 5-18-97

8.3.16 Turn off test load. R.H 5-17-97

8.3.17 Record the Stop Time above the last column on Data Sheet 2, and on Attachment 3. R.H 5-17-97

8.3.18 Open 2D51 disconnect switch. R.H 5-17-97

8.3.19 De-energize load tester. R.H 5-17-97

WARNING

2D01 side of fuse connections are energized. Contact should be avoided when disconnecting cables.

8.3.20 Unbolt and remove the load test cables from the fuse cabinet. R.H 5-17-97

8.3.21 Disconnect any remaining battery load test set control or monitoring cables connected to the battery. R.H 5-17-97

8.4 EQUALIZE CHARGE AND BATTERY RESTORATION

8.4.1 Place the battery on equalize charge by one of the following methods as directed by Cognizant Supervision. Supervision to record below the method to be used.

Method 1 ____ Method 2 ✓ JWB 5-18-97 Supervisor

"Method 1"

A. Install the pin indicating fuses in 2D41. N/A /

B. Install the 1800 Amp fuses. N/A /

C. Close the 2D51 Disconnect Switch. N/A /

* BATTERY VOLTAGE DID NOT REACH 105 VDC. TEST TERMINATED PER SETUP, STEP 8.3.4, AT 9 HOURS.

Wayne Barnes 5-18-97

D. Verify that the electrical lineup is restored and the charger is working properly. N/A /

E. Record below the charger being used.

Charger used: _____ N/A /

F. Place the battery on an equalize charge. (Charger set point is 135.2 to 137.5 volts) Record below the equalizing start time and voltage.

_____ / _____ _____ N/A /
Start time Date Voltage

NOTE

Step 8.5 may be performed at any time after Step 8.4.1.F has been accomplished.

G. Record below the equalize voltage at the battery after 15 hours from the start of equalization.

Battery Terminal Voltage: _____ VDC

MT&E used: _____ Cal. Due: _____ N/A /

2841 F2

H. WHEN the equalize charge current reaches the range of 11-22 amps (end of charge current), THEN place the battery on float charge. Record below the equalizing stop time, date, and voltage.

_____ / _____ / _____ N/A /
Stop time Date Voltage

"Method 2"

NOTE

A Temp. Mod. may be required to power the spare battery charger.

A. Bolt 2-2/C 2/0 AWG cables or greater from the spare 200 Amp battery charger (SCI Model RCS200 or equal) to the battery side of the 1800 Amp fuse connector. R.H 5-18-97

B. Close the 2D51 Disconnect Switch. R.H 5/18-97

NOTE

Charging at the higher equalize voltage of 144 min. - 145 max. will create more gas and heat than at the normal equalize charge of 135.2 to 137.5 volts

C. Place the battery bank on a high level equalize charge of 144 min. - 145 max. volts and perform the following.

NOTE

Banana jacks and wiring will be installed across the shunt and mounted on the charger to facilitate the voltage measurements.

1. Record below the equalizing start time and voltage.

1235 (Start time) 15-18-97 (Date) 144.59 (Voltage) DMM-124

NOTE

Step 8.5 may be performed at any time after the battery has been placed on equalize charge (or at the same time the battery is being placed on equalize charge).

2. Monitor the current supplied by the spare battery charger.

3. Maintain charger voltage at 144 min - 145 max.

4. Monitor electrolyte temperature to ensure it does not exceed 120° F. during the high level equalize charge.

5. When the equalize charge current reaches the range of 20 amps or below, "open" Disconnect switch 2D51 and measure the current by using a Fluke Digital Multimeter 8842A across J1 and J2 of 2D41. (100mv = 20 amps)

6. Stop the equalize charge (by deenergizing the spare battery charger) when the current reaches the range of 11-22 amps as measured in 2D41. Record below the equalizing stop time, date and final measurement reading.

1500 (Stop time) 15-18-97 (Date) 2.1 (Mv) 12 (Amps) 15-18-97

*Note: Placed on float @ 130.38 VDC with temp. charger due to 2D-01 Buss voltage. 5-18-97

DMM-124

D. Verify 2D51 Disconnect switch is open. BP 15-16-97

E. Verify that the spare battery charger is disconnected and determinate the cables from the charger and 2D41. BP 5-18-97

F. Install the 1800 amp fuses. BP 15-16-97

G. Install the pin indicating fuses in 2D41. BP 15-18-97

H. Close the 2D51 Disconnect switch. BP 15-18-97

I. Place the battery on float charge. BP 15-18-97

NOTE

124.7 VDC is the Tech Spec value (lower limit) for a 58 cell bank's float voltage. However, the as left float voltage should be 127.6 to 130.5 when measured at the battery terminal.

8.4.2 Record the float voltage measured at the battery below:

Voltage 129.88 BP 15-18-97

ACCEPTANCE CRITERION

IF the float voltage "is not" within 127.6 to 130.5 volts,
THEN notify the Electrical Supervisor and/or S/S for an evaluation of the problem.
IF the float voltage is below 124.7 VDC,
THEN "immediately" notify the Electrical Supervisor and S/S that a possible Tech Spec violation exists.

8.5 BATTERY CAPACITY CALCULATION

8.5.1 IF Attachment 2 was used,
THEN use the new calculated T_A from step 15 of Attachment 2;
IF NOT,
THEN obtain T_A from Data Sheet 2,
(Start Time - Stop Time) N/A

8.5.2 IF the discharge was stopped in step 8.2.11,
THEN the time that the discharge was stopped (from data in 8.2.11) must be subtracted from the T_A to obtain the actual length of the test (T_A) for step 8.5.3;
IF NOT,
THEN mark this step N/A. N/A

NOTE

The following calculations is required to comply with Tech Spec step 4.8.2.3 E.

8.5.3 Determine the capacity of the battery by completing the following equation:

% capacity at 77°F = $(T_A / T_S) \times 100$

T_A = Actual time of the test to specified terminal voltage 105 volts if no cells were jumpered in minutes (See Data Sheet 2).

T_S = Rated time to specified terminal voltage in minutes (8hrs. or 480 minutes)

T_A (minutes) 540 / 480 minutes x 100 = 112.5 % capacity

R.H 15-21-97

See CR-2-97-0444 Actual Capacity Should Have Been 106% T. Hall George 7 4/3/97

SECOND PERSON VERIFIER

A Second Person Verifier shall repeat the calculations for determining the capacity of the battery.

T_A (minutes) 540 / 480 minutes x 100 = 112.5 % capacity

Allen Rechnitz 15 21 97
Second Person Verifier Date

NOTE

Per Tech Spec 4.8.2.3.C.e and f, battery capacity must be ≥ 80%. However, if capacity is < 90°, then the 60 Month Performance Discharge Test must be performed every 18 months.

8.5.4 IF the capacity calculated is less than 90%, THEN notify maintenance engineer for evaluation. IF the capacity is greater than or equal to 90%, THEN mark this step N/A. N/A /

8.6 BATTERY MAINTENANCE

NOTE

When tightening the terminal connectors, two insulated wrenches should be used, applying one as counter-torque to prevent damage to the terminal post. If just checking the torque of a 5/16 inch stainless bolt connection that was not disassembled then 125 in/lb is the proper value. If the connection was loosened or disassembled then torque to 165 in/lbs. Step 8.6.1 through 8.6.7 may be accomplished at any time after Step 8.4.6 has been accomplished. Steps 8.6.8 through 8.6.10 may be accomplished after equalize charge current diminishes to a low enough level such that charge current does not affect resistance readings.

8.6.1 Verify that all battery connections are tight by torquing each intercell/intertier connection to 125 in/lbs R.H 15-22-97

8.6.2 Record below the torque wrench used, calibration due date and the torque values:

Torque wrench number: TW-107

Calibration due date: 8-5-97

Torque value: 125 IN.LBS. R.H 1/5-22-97

QC HOLD

A QC inspector is to be present to witness reading of the battery connection resistance in Steps 8.6.3 through Steps 8.6.7 for procedure compliance and to sign Data Sheet 3 upon completion.

NOTE

The micro-ohm limit is for the intercell straps and cable connections. The cable connections need to be measured from the battery post to terminal lug.

8.6.3 Perform an "As Left" micro-ohm check using step 8.1.6 as a guideline and record the reading in the "As Left" section of Data Sheet 3.

8.6.4 Verify if any intercell micro-ohm reading is greater than 150 micro-ohms and check the appropriate space below:

☐ Yes ☒ NO

IF the answer is "yes",
THEN proceed to step 8.6.5.
IF the answer is "no",
THEN mark steps 8.6.5 through 8.6.7 "N/A" and proceed to step 8.6.8.

8.6.5 IF the answer to 8.6.4 was "Yes",
THEN perform the following;
IF NOT,
THEN mark the following steps N/A.

A. Open disconnect switch 2D51. N/A /

B. Disassemble the affected connection(s). N/A /

C. Clean and neutralize the affected connections using baking soda and water, then coat the connections per C&D Manual (TM C 173.0010) and reassemble. N/A /

D. Torque the affected connections to 165 in/lbs. N/A /

E. Micro-ohm the affected connections. N/A /

F. Record the micro-ohm readings of the affected connections on Data Sheet flagging them as the second "As Left" reading. N/A /
IF the second "As Left" reading IS acceptable,
THEN proceed to step 8.6.7.
IF the second "As Left" reading is NOT acceptable,
THEN proceed to step 8.6.6.

8.6.6 IF the reading is still unacceptable,
THEN perform the following.
IF the reading is acceptable,
THEN mark steps A through F "N/A" and proceed to step 8.6.7.

A. Verify Disconnect Switch 2D51 is open. N/A /

B. Replace the affected parts. N/A /

C. Clean and neutralize replacement parts and coat connections per C&D Manual (TM C 173.0010) and reassemble. N/A /

D. Torque connections to 165 in/lbs. N/A /

E. Obtain an "As Left" resistance reading. N/A /

F. Record action taken and readings on the "As Left" comments section of Data Sheet 3. N/A /

8.6.7 Close Disconnect Switch 2D51. N/A /

8.6.8 Place the battery bank on Float charge and record the time, date and float voltage below:

Time and Date 1500 5-18-97
Float Voltage 129.88 VDC

RH 15-22-97

8.6.9 Perform 3 random specific gravity readings on the 2D11 battery bank, using procedure 2403.024 as a guide, to determine if stratification of these cells exist.

A. IF stratification of the tested cells electrolyte exists, N/A /
THEN mix the electrolyte in each cell of the battery bank for 30 minutes on each cell, using a variable speed micro pump, with suction taken from the top of the cells through the flame arrestor hole, and discharge through the sample tube to the bottom of the cells;
IF NOT,
THEN mark this step N/A.

B. Perform all sections of Quarterly 2403.024, except the micro-ohm readings, and attach it to this procedure. RH 1S-22-97

9.0 RESTORATION AND CHECKOUT

9.1 IF any Condition Reports were issued during the performance of this procedure,
THEN attach a copy of the Condition Report to this procedure;
IF NOT,
THEN mark this step N/A. N/A

9.2 Verify that the requirements of Housekeeping Level II have been met. RH 1S-22-97

9.3 Verify that the measuring and test equipment have no known deficiency. RH 1S-22-97

9.4 Verify with operations that 2D11 has been returned to its normal operation/lineup. RH 1S-22-97

NOTE

124.7 VDC is the Tech Spec value (lower limit) for a 58 cell bank's float voltage. However, the as left float voltage should be 127.6 to 130.5 when measured at the battery terminal.

9.5 Verify that the battery bank float voltage is between 127.6 and 130.5 VDC when on normal float charge. RH 1S-22-97

9.6 Verify that all cell-to-cell and terminal connections are less than or equal to 150 mocro-ohms. RH 1S-22-97

9.7 Verify that the battery log book ~~has been updated~~ to include the following:

9.7.1 Date this procedure was performed. RH 1S-22-97

9.7.2 Time this procedure was started. RH 1S-22-97

9.7.3 Time this procedure was completed. RH 1S-22-97

9.7.4 Any problems encountered and corrective action taken. RH 1S-22-97

9.7.5 Performer of this procedure. RH 1S-22-97

9.8 Notify the Unit 2 Operations S/S that 2D11 Performance Discharge Test is complete. RH 1S-22-97

9.9 Perform post test check of torque wrenches on Torque Tester and record the following: JHH 5/7/97 RJH 5/22/97 JHH 6/1/97

Equip. No. ~~TT-018~~ TT-018 Cal. Due Date ~~10/14/97~~ 10-14-97

Equip. No. ~~TW-705~~ TW-707 JHH 5/7/97 Cal. Due Date ~~8/5/97~~ 8-5-97 JHH 5/7/97 RJH 5-22-97 JHH 5/7/97

9.10 All setpoints and tolerances in this procedure have been checked and are verified to be within the limits herein specified and any exceptions are noted.

Kurt Brown 5/22/97
Maintenance Supervisor Date

10.0 ATTACHMENTS AND FORMS

10.1 ATTACHMENTS

10.1.1 Attachment 1 - Discharge Current Correction K Factor For Temperature

10.1.2 Attachment 2 - Jumpering Low Voltage Cells

10.1.3 Attachment 3 - Calculation for Total Down Time

10.1.4 Data Sheet 1 - "As Found" Resistance

10.1.5 Data Sheet 2 - Performance Discharge Test Battery Bank Voltage

10.1.6 Data Sheet 3 - "As Left" Resistance

10.2 FORMS

10.2.1 None

ATTACHMENT 1

DISCHARGE CURRENT CORRECTION
FACTOR K FOR TEMPERATURE

Temperature (F)	Factor K

Cell No.	Temp. (F)
1	~~81.8°~~ 82°
6	82°
12	82°
18	82°
24	82°
30	82°
36	~~81.6°~~ 82°
43	~~81.8~~ 82°
48	82°
54	82°

Temp. Total for 10 cells = 820

Temp. Total for 10 cells / 10 = Avg. Temp.

Average Temp. = 82 °F

Req. Factor K = 0.972

Average Temp. (F)	Factor K
62	1.098
63	1.092
64	1.086
65	1.080
66	1.072
67	1.064
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
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

Test Equip. # DT-070 Cal. Due: 9/13/97

J. Hamlin — Performed By — 5/17/97 Date

James R. Rowland — Second Person Verifier — 5/17/97 Date

ATTACHMENT 2

Performance Test Cell Jumpering Procedure

NOTE

This Attachment provides a method to BY-PASS a low voltage cell.

NOTE

Maintenance Engineering shall review Attachment 2 if attachment is required for procedure completion.

NOTE

A Second Person Verifier shall verify the content of steps 10, 11, and 15.

NOTE

Two - 250 mcm cables with 3/8 - 1/2 lug, cables approximate length is 10 feet will be needed for the cell jumpering. These are available in the Maintenance Facility Battery Storage Room.

1. Record the number of the cell(s) at or below 0.75 VDC, the Stop Time, the Cell voltage and the Bank Voltage below and on Attachment 3.

   Cell Number:_____ Cell Voltage:_____ Stop Time:_____ Bank Voltage:_____

   Cell Number:_____ Cell Voltage:_____ Stop Time:_____ Bank Voltage:_____

   Cell Number:_____ Cell Voltage:_____ Stop Time:_____ Bank Voltage:_____

   Cell Number:_____ Cell Voltage:_____ Stop Time:_____ Bank Voltage:_____

NOTE

At this time the Cognizant Supervisor shall make the judgement to determine if the cell(s) should be jumpered or to continue the test with the cell(s) installed. This judgement should be based on Total Test Time, overall Bank Voltage, and the number of cells at or below 0.75 volts.

2. IF the Cognizant Supervisor's judgment is to continue the test with the cell(s) installed,
   THEN restart the discharge at the calculated current and record the restart time below and on Attachment 3. Continue recording data on Data Sheet 2 and discharge the bank until the bank voltage approaches 105 VDC, N/A Steps 3 through 11 of this Attachment and continue with Step 12.

   IF the Cognizant Supervisor's judgement is to jumper the cell(s),
   THEN mark "Restart Time" below N/A and continue with Step 3.

   Restart Time:_____

   _____ /_____
   Cognizant Supervisor Date

ATTACHMENT 2

3. Open 2D51 Disconnect Switch. /

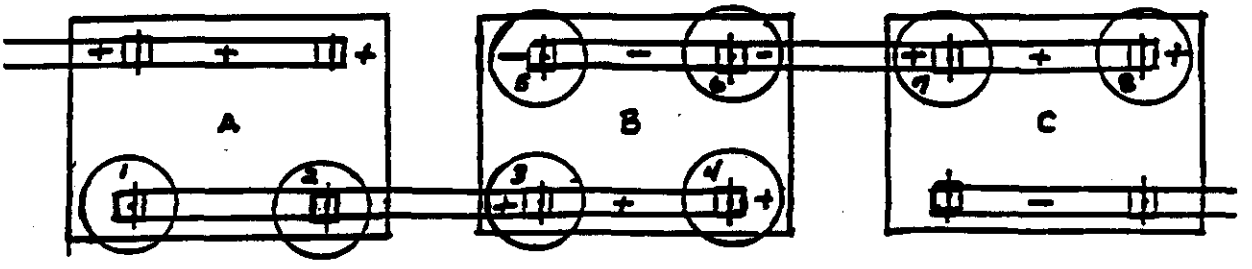

Figure 1

WARNING

Jumpering, shorting or connecting the positive and negative lugs of a single cell may cause equipment damage or personnel injury.

NOTE

Jumpering of end cell may be accomplished by using the inter-tier or inter-bank cables.

4. Using Figure 1 as a guide only and presuming "B" is the affected cell then remove bolts and intercell connection straps from the low voltage cell and its adjacent cell terminals.

NOTE

Based on which is the low cell you may be jumpering the negative of A to the positive of C. As shown below in figure 2.

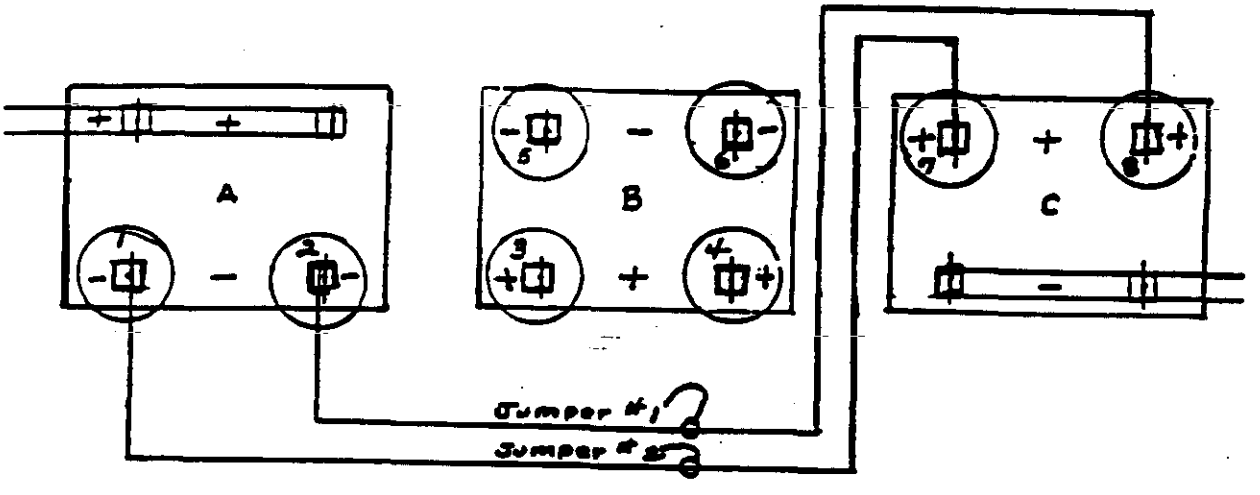

Figure 2

ATTACHMENT 2

5. Bolt a (250 mcm) jumper from the left negative Battery A terminal to the left positive Battery C terminal, using the same stainless bolts as used in the intercell connection straps. ____/

6. Bolt another (250 mcm) jumper from the right negative Battery A terminal to the right positive Battery C terminal, using the same stainless bolts as used in the intercell connection straps. ____/

7. Torque terminal bolts to 165 in/lbs and record below the torque value and the recal date: ____/

   Torque wrench number:_____

   Torque value:_____

   Recal Date:_____

8. Discharge the battery to a new voltage of ____/

   105 - (1.81 x # of Cells Jumpered) - new voltage

   Example:

   105 - (1.81 x 1 cell) = 103.19 VDC

   105 - (1.81 x 2 cells) = 101.38 VDC

   105 - (1.81 x _____) - _____ New Discharge Voltage

SECOND PERSON VERIFIER

A Second Person Verifier shall verify the "New Discharge Voltage" in step 8 is correct.

_____/_____
Second Person Verifier Date

9. Close 2D51 Disconnect Switch. ____/

CAUTION

While discharging, continue to watch for cells falling below .75 VDC.

10. Restart discharge at the calculated current. ____/

ATTACHMENT 2

11. Record the restart time (below and on Attachment 3), and battery terminal voltage after the load is applied:

    Discharge started at _____ Amps

    Time restarted:_____

    Overall battery terminal voltage _____ VDC _____/

SECOND PERSON VERIFIER

A Second Person Verifier shall verify step 11 was correctly completed.

_____/_____
Second Person Verifier Date

12. Read and record in the last column of Data Sheet 2, the discharge battery overall bank voltage and cell voltages in the final moments before the minimum calculated voltage is reached.

13. Stop the test and de-energize the test equipment. Record the Stop Time on Attachment 3, on Data Sheet 2 and below:

    Stop Time:_____ _____/

14. Open 2D51 disconnect switch. _____/

15. Find the Down Time and old T_A from Attachment 3 and use below to figure the New T_A:

    Old T_A _____ - Down Time _____ = $\frac{\quad}{\text{New } T_A}$ _____/

SECOND PERSON VERIFIER

A Second Person Verifier shall verify the "New TA" in step 15 is correct.

_____/_____
Second Person Verifier Date

ATTACHMENT 2

16. IF cells were jumpered due to low voltage, THEN Engineering and the Cognizant Supervisor must be notified and an evaluation made of cell condition prior to re-assembly of battery connections. ____/____

17. IF cells were jumpered, THEN restore battery connections as follows:

    A. Clean and neutralize the affected connections using baking soda and water.

    B. Coat the connections per C&D Manual (TM C 173.0010) and reassemble. ____/____

18. IF cells were jumpered, THEN torque the connections to 165 in/lbs and record below the torque value used and the recal date of the torque wrench used. ____/____

    Torque wrench number:_____

    Torque value:.....:_____

    Calibration due date:_____ ____/____

19. IF cells were jumpered, THEN micro-ohm the affected connections and record the affected connections on Data Sheet, flagging them as the second "As Left" reading. ____/____

20. Mark Steps 8.3.13 through 8.3.19 N/A and proceed with Step 8.3.20 ____/____

NOTE

Maintenance Engineering's signature is not needed to continue the work.

21. Maintenance Engineering has reviewed data of Attachment 2.

_____/_____
Maintenance Engineering Date

ATTACHMENT 3

CALCULATION FOR TOTAL DOWN TIME

1. Start Time, Stop Time

(A) Start Time: 12:18:30 (B) Stop Time: 21:18:30 S.H 15-7-97

(C) Start Time:_____ (D) Stop Time:_____ _____/

(E) Start Time:_____ (F) Stop Time:_____ _____/

(G) Start Time:_____ (H) Stop Time:_____ _____/

SECOND PERSON VERIFIER

A Second Person Verifier shall verify the "Start, Stop" time in step 1 is correct.

W. Davis 15/17/97
Second Person Verifier Date

NOTE

The Total Down Time Calculation is for the Total Time the test is stopped for jumpering cell(s), broken test equipment etc. The Final Stop Time (last stop time from above) shall not be used in the calculation.

2. Total Down Time

Total Down Time (in minutes) = (C - B) + (E - D) + (G - F)

Total Down Time
(in minutes) = (____ -____) + (____-____) + (____-____) = _____ N/A

SECOND PERSON VERIFIER

A Second Person Verifier shall verify the "Start, Stop" time in step 1 is correct.

N/A
Second Person Verifier Date

3. Old T_A Calculation

Old T_A = (A) - (Final Stop Time)

Old T_A = _____ N/A

SECOND PERSON VERIFIER

A Second Person Verifier shall verify calculations are correct in step 3.

N/A
Second Person Verifier Date

ATTACHMENT 4

MINIMUM SAFETY APPAREL FOR BATTERY MAINTENANCE***

Activity	Safety Glasses w/side shield	Apron	Gloves	Face Shield or Goggles*	Plastic Suit	Eye Wash Station
Cell or Battery Change Out	X		X	X	X	X
Daily Surveillance	X		X			X
Weekly Surveillance	X		X			X
Quarterly Surveillance and Discharge Tests	X		X			X
Electrolyte Add or Removal	X	X	X	X		X
Electrolyte Mixing	X	X	X	X		X
Connection Cleaning and or Disconnecting	X		X			X
Adding Water	X		X			X
Cell Cleaning	X		X			X
Emergency 12 Volt Light Battery Maintenance Minimum Requirements	X		X			
Diesel Fire Pump or Diesel Generator Battery Surveillance	X		X			
Change Out	X		X	X		

*Face shields may be worn without hard hats, and must be non-metallic
**Hard Hats are not required inside Station Battery Room while performing routine battery maintenance.
***Applies to person subjected to hazard only.

DATA SHEET 1

"AS FOUND"

BATTERY BANK 2D11

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	1N1-2P1	1N2-2P2
1 - 2	17	19
	2N1-3P1	2N2-3P2
2 - 3	22	21
	3N1-4P1	3N2-4P2
3 - 4	21	25
	4N1-5P1	4N2-5P2
4 - 5	22	27
	5N1-6P1	5N2-6P2
5 - 6	20	21
	6N1-7P1	6N2-7P2
6 - 7	19	20
	7N1-8P1	7N2-8P2
7 - 8	21	22
	8N1-9P1	8N2-9P2
8 - 9	20	20
	9N1-10P1	9N2-10P2
9 - 10	21	20
	10N1-11P1	10N2-11P2
10 - 11	20	22
	11N1-12P1	11N2-12P2
11 - 12	24	23
	12N1-13P1	12N2-13P2
12 - 13	23	21
	13N1-14P1	13N2-14P2
13 - 14	20	20
	14N1-15P1	14N2-15P2
14 - 15	29	23

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	15N1-16P1	15N2-16P2
15 - 16	19	20
	16N1-17P1	16N2-17P2
16 - 17	20	20
	17N1-18P1	17N2-18P2
17 - 18	21	23
	18N1-19P1	18N2-19P2
18 - 19	20	23
	20N1-21P1	20N2-21P2
20 - 21	19	19
	21N1-22P1	21N2-22P2
21 - 22	19	21
	22N1-23P1	22N2-23P2
22 - 23	20	20
	23N1-24P1	23N2-24P2
23 - 24	18	19
	24N1-25P1	24N2-25P2
24 - 25	18	18
	25N1-26P1	25N2-26P2
25 - 26	18	21
	26N1-27P1	26N2-27P2
26 - 27	20	20
	27N1-28P1	27N2-28P2
27 - 28	19	19
	28N1-29P1	28N2-29P2
28 - 29	22	19

DATA SHEET 1

"AS FOUND"

BATTERY BANK 2D11

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	29N1-30P1	29N2-30P2
29 - 30	19	21
	30N1-31P1	30N2-31P2
30 - 31	30	27
	31N1-32P1	31N2-32P2
31 - 32	23	21
	32N1-33P1	32N2-33P2
32 - 33	20	20
	33N1-34P1	33N2-34P2
33 - 34	20	22
	34N1-35P1	34N2-35P2
34 - 35	25	23
	35N1-36P1	35N2-36P2
35 - 36	22	25
	36N1-37P1	36N2-37P2
36 - 37	21	25
	37N1-38P1	37N2-38P2
37 - 38	19	21
	38N1-39P1	38N2-39P2
38 - 39	22	21
	40N1-41P1	40N2-41P2
40 - 41	17	18
	41N1-42P1	41N2-42P2
41 - 42	17	19
	42N1-43P1	42N2-43P2
42 - 43	19	17
	43N1-44P1	43N2-44P2
43 - 44	17	19

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	44N1-45P1	44N2-45P2
44 - 45	19	22
	45N1-46P1	45N2-46P2
45 - 46	19	18
	46N1-47P1	46N2-47P2
46 - 47	22	18
	47N1-48P1	47N2-48P2
47 - 48	19	19
	48N1-49P1	48N2-49P2
48 - 49	21	19
	49N1-50P1	49N2-50P2
49 - 50	20	23
	50N1-51P1	50N2-51P2
50 - 51	19	18
	51N1-52P1	51N2-52P2
51 - 52	19	20
	52N1-53P1	52N2-53P2
52 - 53	19	19
	53N1-54P1	53N2-54P2
53 - 54	27	19
	54N1-55P1	54N2-55P2
54 - 55	19	18
	55N1-56P1	55N2-56P2
55 - 56	17	17
	56N1-57P1	56N2-57P2
56 - 57	18	19
	57N1-58P1	57N2-58P2
57 - 58	19	19

DATA SHEET 1

"AS FOUND"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
	1P1-TERM. PLT.
TERMINAL PLATE TO CELL # 1	4
	1P2-TERM. PLT.
	4
	TERM. PLT.-LUG#1
	19
TERMINAL PLATE TO INCOMING 250 MCM CABLE LUGS CELL # 1	TERM. PLT.-LUG#2
	21
	TERM. PLT.-LUG#3
	16
	19N1-TERM. PLT.
TERMINAL PLATE TO CELL # 19	6
	19N2-TERM. PLT.
	6
	TERM. PLT.-LUG#1
	5
	TERM. PLT.-LUG#2
	7
	TERM. PLT.-LUG#3
TERMINAL PLATE ON CELL # 19 TO INTERTIER 4/0 CABLE LUGS	6
	TERM. PLT.-LUG#4
	6
	TERM. PLT.-LUG#5
	5
	TERM. PLT.-LUG#6
	4

DATA SHEET 1

"AS FOUND"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
	20P1-TERM. PLT.
TERMINAL PLATE TO CELL # 20	5
	20P2-TERM. PLT.
	6
	TERM. PLT.-LUG#1
	7
	TERM. PLT.-LUG#2
	7
	TERM. PLT.-LUG#3
TERMINAL PLATE ON CELL # 20 TO INTERTIER 4/0 CABLE LUGS	5
	TERM. PLT.-LUG#4
	5
	TERM. PLT.-LUG#5
	6
	TERM. PLT.-LUG#6
	7
	39N1-TERM. PLT.
TERMINAL PLATE TO CELL # 39	4
	39N2-TERM. PLT.
	4
	TERM. PLT.-LUG#1
	8
TERMINAL PLATE ON CELL # 39 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#2
	7
	TERM. PLT.-LUG#3
	7

DATA SHEET 1

"AS FOUND"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
TERMINAL PLATE ON CELL # 39 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#4: 6
	TERM. PLT.-LUG#5: 5
	TERM. PLT.-LUG#6: 3
TERMINAL PLATE TO CELL # 40	40P1-TERM. PLT.: 7
	40P2-TERM. PLT.: 6
TERMINAL PLATE ON CELL # 40 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#1: 5
	TERM. PLT.-LUG#2: 4
	TERM. PLT.-LUG#3: 4
	TERM. PLT.-LUG#4: 4
	TERM. PLT.-LUG#5: 6
	TERM. PLT.-LUG#6: 5
TERMINAL PLATE TO CELL # 58	58N1-TERM. PLT.: 2
	58N2-TERM. PLT.: 6

DATA SHEET 1

"AS FOUND"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
	TERM. PLT.-LUG#1
	4
TERMINAL PLATE TO OUTGOING 250 MCM CABLE LUGS CELL # 58	TERM. PLT.-LUG#2
	3
	TERM. PLT.-LUG#3
	2

COMMENTS: _____

Test Equip. and Cal. Due. Date: DLRO-002 / 10/7/97 _____/_____

_____/_____, _____/_____, _____/_____

_____/_____, _____/_____, _____/_____

Performed by:..... Jim Hm 5-17-97 Date

Second Person Verifier: James G Rowland 5/17/97 Date

QC Witnessed by:..... Jim W Hm 5/17/97 Date

DATA SHEET 2

Performance Discharge Test
Battery Bank and Cell Voltages
Battery Bank 2D11

Start Time 12/8:30

Cell No.	30 Min.	1 Hour	1 Hour 30 Min.	2 Hours	2 Hours 30 Min.	3 Hours	3 Hours 30 Min.	4 Hours	4 Hours 30 Min.
1	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
2	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.94
3	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
4	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.94
5	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.94
6	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
7	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
8	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.94
9	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
10	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
11	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.94
12	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
13	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
14	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
15	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
16	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
17	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
18	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
19	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
20	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
21	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
22	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
23	2.00	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
24	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
25	2.01	2.01	2.00	1.99	1.99	1.98	1.97	1.97	1.96
26	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
27	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
28	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
29	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
30	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
31	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
32	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
Bank Volts	115.7	115.6	116.4	115.1	114.7	114.3	113.9	113.5	113.0

Performed by Rick Hall 1-17-97
Signature Date

DATA SHEET 2

Performance Discharge Test
Battery Bank and Cell Voltages
Battery Bank 2D11

Cell No.	30 Min.	1 Hour	1 Hour 30 Min.	2 Hours	2 Hours 30 Min.	3 Hours	3 Hours 30 Min.	4 Hours	4 Hours 30 Min.
33	2.00	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
34	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
35	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
36	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
37	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
38	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
39	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
40	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
41	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.94
42	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
43	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
44	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
45	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95	1.94
46	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
47	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
48	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
49	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
50	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
51	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
52	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
53	1.99	1.99	1.98	1.98	1.97	1.97	1.96	1.95	1.94
54	1.99	1.99	1.99	1.98	1.97	1.97	1.96	1.95	1.95
55	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
56	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.95	1.95
57	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
58	1.99	1.99	1.99	1.98	1.98	1.97	1.96	1.96	1.95
Disch Rate (Amps)	254	254	254	253	252	251	250	252	251

Performed by Rick Hall 5/17/97
Signature Date

Test Equip: BCT-003 Cal. Due: 8-20-97

DATA SHEET 2

Performance Discharge Test
Battery Bank and Cell Voltages
Battery Bank 2D11

Cell No.	5 Hours	5 Hours 30 Min.	6 Hours	6 Hours 30 Min.	7 Hours	7 Hours 30 Min.	8 Hours	8 Hours 30 Min.	9 Hours
1	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
2	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.83
3	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
4	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
5	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.83
6	1.93	1.93	1.92	1.91	1.90	1.89	1.87	1.85	1.83
7	1.93	1.93	1.92	1.91	1.90	1.88	1.87	1.85	1.83
8	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
9	1.93	1.92	1.91	1.90	1.89	1.88	1.87	1.85	1.83
10	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
11	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
12	1.93	1.93	1.92	1.91	1.90	1.89	1.87	1.85	1.83
13	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.85
14	1.93	1.93	1.92	1.91	1.90	1.88	1.87	1.85	1.83
15	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.85
16	1.94	1.93	1.92	1.92	1.91	1.89	1.88	1.87	1.85
17	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
18	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
19	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
20	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
21	1.93	1.92	1.91	1.90	1.89	1.88	1.87	1.85	1.82
22	1.94	1.93	1.92	1.91	1.90	1.88	1.87	1.85	1.83
23	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
24	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.87	1.85
25	1.95	1.94	1.94	1.93	1.92	1.91	1.89	1.88	1.86
26	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
27	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
28	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
29	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
30	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
Bank Volts	112.6	112.1	111.6	111.0	110.4	109.7	109.0	108.0	106.8

Performed by Rick Hall 1-5-97
Signature Date

NOTE

Terminal voltage of 105 volts may be reached before a hour or ½ hour reading can be taken. Indicate the number of minutes past the hour or half hour above the column where the last reading was taken at test completion.

DATA SHEET 2

Performance Discharge Test
Battery Bank and Cell Voltages

Bank Voltage: 106.8
Start Time: 12:18:30
Stop Time: 21:18:30

Battery Bank 2D11

Cell No.	5 Hours	5 Hours 30 Min.	6 Hours	6 Hours 30 Min.	7 Hours	7 Hours 30 Min.	8 Hours	8 Hours 30 Min.	9 Hours
31	1.93	1.93	1.92	1.91	1.90	1.89	1.87	1.85	1.83
32	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
33	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
34	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
35	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.85	1.83
36	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.83
37	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.83
38	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.87	1.85
39	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
40	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.83
41	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
42	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
43	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
44	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
45	1.93	1.93	1.92	1.91	1.90	1.88	1.87	1.85	1.83
46	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
47	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
48	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
49	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
50	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.86	1.84
51	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
52	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.85
53	1.94	1.93	1.92	1.91	1.90	1.89	1.87	1.85	1.83
54	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
55	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
56	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
57	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.87	1.85
58	1.94	1.93	1.92	1.91	1.90	1.89	1.88	1.86	1.84
Disch Rate (Amps)	251	250	254	253	251	250	251	252	249

Performed by Rick Hall 1200
Signature Time

NOTE

Terminal voltage of 105 volts may be reached before a hour or ½ hour reading can be taken. Indicate the number of minutes past the hour or half hour above the column where the last reading was taken at test completion.

DATA SHEET 3

"AS LEFT"

BATTERY BANK 2D11

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	1N1-2P1	1N2-2P2
1 - 2	20	19
	2N1-3P1	2N2-3P2
2 - 3	22	21
	3N1-4P1	3N2-4P2
3 - 4	25	23
	4N1-5P1	4N2-5P2
4 - 5	26	22
	5N1-6P1	5N2-6P2
5 - 6	22	21
	6N1-7P1	6N2-7P2
6 - 7	20	20
	7N1-8P1	7N2-8P2
7 - 8	22	23
	8N1-9P1	8N2-9P2
8 - 9	22	21
	9N1-10P1	9N2-10P2
9 - 10	20	22
	10N1-11P1	10N2-11P2
10 - 11	23	23
	11N1-12P1	11N2-12P2
11 - 12	23	26
	12N1-13P1	12N2-13P2
12 - 13	22	25
	13N1-14P1	13N2-14P2
13 - 14	21	20
	14N1-15P1	14N2-15P2
14 - 15	23	29

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	15N1-16P1	15N2-16P2
15 - 16	23	20
	16N1-17P1	16N2-17P2
16 - 17	21	21
	17N1-18P1	17N2-18P2
17 - 18	23	22
	18N1-19P1	18N2-19P2
18 - 19	23	20
	20N1-21P1	20N2-21P2
20 - 21	21	18
	21N1-22P1	21N2-22P2
21 - 22	17	21
	22N1-23P1	22N2-23P2
22 - 23	21	20
	23N1-24P1	23N2-24P2
23 - 24	20	20
	24N1-25P1	24N2-25P2
24 - 25	19	19
	25N1-26P1	25N2-26P2
25 - 26	19	20
	26N1-27P1	26N2-27P2
26 - 27	20	21
	27N1-28P1	27N2-28P2
27 - 28	20	19
	28N1-29P1	28N2-29P2
28 - 29	21	20

DATA SHEET 3

"AS LEFT"

BATTERY BANK 2D11

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	29N1-30P1	29N2-30P2
29 - 30	19	20
	30N1-31P1	30N2-31P2
30 - 31	28	25
	31N1-32P1	31N2-32P2
31 - 32	22	22
	32N1-33P1	32N2-33P2
32 - 33	20	20
	33N1-34P1	33N2-34P2
33 - 34	20	21
	34N1-35P1	34N2-35P2
34 - 35	23	23
	35N1-36P1	35N2-36P2
35 - 36	24	25
	36N1-37P1	36N2-37P2
36 - 37	21	24
	37N1-38P1	37N2-38P2
37 - 38	20	19
	38N1-39P1	38N2-39P2
38 - 39	19	21
	40N1-41P1	40N2-41P2
40 - 41	21	19
	41N1-42P1	41N2-42P2
41 - 42	20	19
	42N1-43P1	42N2-43P2
42 - 43	19	19
	43N1-44P1	43N2-44P2
43 - 44	21	20

BATTERY RACK CELL TO CELL CONNECTIONS	RECORD RESISTANCE IN MICRO-OHMS FOR LISTED CONNECTIONS	
	44N1-45P1	44N2-45P2
44 - 45	24	19
	45N1-46P1	45N2-46P2
45 - 46	20	20
	46N1-47P1	46N2-47P2
46 - 47	20	24
	47N1-48P1	47N2-48P2
47 - 48	21	20
	48N1-49P1	48N2-49P2
48 - 49	20	21
	49N1-50P1	49N2-50P2
49 - 50	24	21
	50N1-51P1	50N2-51P2
50 - 51	21	20
	51N1-52P1	51N2-52P2
51 - 52	23	21
	52N1-53P1	52N2-53P2
52 - 53	21	18
	53N1-54P1	53N2-54P2
53 - 54	24	30
	54N1-55P1	54N2-55P2
54 - 55	20	19
	55N1-56P1	55N2-56P2
55 - 56	20	19
	56N1-57P1	56N2-57P2
56 - 57	21	18
	57N1-58P1	57N2-58P2
57 - 58	21	22

DATA SHEET 3

"AS LEFT"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
	1P1-TERM. PLT.
TERMINAL PLATE TO CELL # 1	5
	1P2-TERM. PLT.
	4
	TERM. PLT.-LUG#1
	6
TERMINAL PLATE TO INCOMING 250 MCM CABLE LUGS CELL # 1	TERM. PLT.-LUG#2
	5
	TERM. PLT.-LUG#3
	5
	19N1-TERM. PLT.
TERMINAL PLATE TO CELL # 19	4
	19N2-TERM. PLT.
	6
	TERM. PLT.-LUG#1
	6
	TERM. PLT.-LUG#2
	7
	TERM. PLT.-LUG#3
TERMINAL PLATE ON CELL # 19 TO INTERTIER 4/0 CABLE LUGS	6
	TERM. PLT.-LUG#4
	7
	TERM. PLT.-LUG#5
	7
	TERM. PLT.-LUG#6
	7

DATA SHEET 3

"AS LEFT"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
TERMINAL PLATE TO CELL # 20	20P1-TERM. PLT. 8
	20P2-TERM. PLT. 6
TERMINAL PLATE ON CELL # 20 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#1 7
	TERM. PLT.-LUG#2 5
	TERM. PLT.-LUG#3 P.H 5-22-97 10 7
	TERM. PLT.-LUG#4 9
	TERM. PLT.-LUG#5 9
	TERM. PLT.-LUG#6 6
TERMINAL PLATE TO CELL # 39	39N1-TERM. PLT. 7
	39N2-TERM. PLT. 9
TERMINAL PLATE ON CELL # 39 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#1 8
	TERM. PLT.-LUG#2 7
	TERM. PLT.-LUG#3 6

DATA SHEET 3

"AS LEFT"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
TERMINAL PLATE ON CELL # 39 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#4: 8 TERM. PLT.-LUG#5: 7 TERM. PLT.-LUG#6: 8
TERMINAL PLATE TO CELL # 40	40P1-TERM. PLT.: 7 40P2-TERM. PLT.: 7
TERMINAL PLATE ON CELL # 40 TO INTERTIER 4/0 CABLE LUGS	TERM. PLT.-LUG#1: 8 TERM. PLT.-LUG#2: 9 TERM. PLT.-LUG#3: 9 TERM. PLT.-LUG#4: 8 TERM. PLT.-LUG#5: 6 TERM. PLT.-LUG#6: 8
TERMINAL PLATE TO CELL # 58	58N1-TERM. PLT.: 4 58N2-TERM. PLT.: 6

DATA SHEET 3

"AS LEFT"

BATTERY BANK 2D11

BATTERY RACK CELL TO TERMINAL PLATE AND TERMINAL PLATE TO CABLE CONNECTIONS	RECORD RESISTANCE IN MICRO OHMS FOR LISTED CONNECTIONS
	TERM. PLT.-LUG#1
	7
TERMINAL PLATE TO OUTGOING 250 MCM CABLE LUGS CELL # 58	TERM. PLT.-LUG#2
	8
	TERM. PLT.-LUG#3
	8

COMMENTS: _____

Test Equip. and Cal. Due. Date: DLRO-002 / 10-7-97, _____ / _____

_____ / _____, _____ / _____, _____ / _____

_____ / _____, _____ / _____, _____ / _____

Performed by:..... Rick Hall 5-22-97 Date

Second Person Verifier: [signature] 5-22-97 Date

QC Witnessed by:..... [signature] 5-22-97 Date