



***OPERATING INSTRUCTIONS***

***FOR***

***ProEase DataFX™***

***BATTERY MEASUREMENT  
&  
DOCUMENTATION SYSTEM***

**P/N 121711-004**

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**OPERATING INSTRUCTIONS FOR ProEase DataFX  
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**LIMITED WARRANTY**

**ProEase DataFX AVIATION BATTERY**

**MEASUREMENT & DOCUMENTATION SYSTEM**

**MANUFACTURED BY MARATHONNORCO AEROSPACE, INC.**

MarathonNorco Aerospace, Inc. warrants the ProEase DataFX to the extent of the parts necessary to correct any defect in workmanship or materials which may develop under proper and normal use for a period of one (1) year from date of receipt of the equipment by the customer, but not to exceed eighteen (18) months from the date of shipment from Marathon. This warranty also includes any labor necessary to effect such repair, if the DataFX is returned to MarathonNorco Aerospace, Inc. in Waco, Texas, USA, properly packaged and insured.

The above shall constitute fulfillment of all MarathonNorco liabilities in respect to said equipment, and MarathonNorco shall not be liable for any consequential damages nor for any damage in shipment. The DataFX or faulty part must be returned to MarathonNorco. The cost of any transportation and insurance is not included with this warranty.

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**TD-687**

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**RECORD OF REVISIONS**

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## 1.0 INTRODUCTION

The ProEase DataFX is a versatile battery servicing monitoring instrument. As a stand-alone product, the ProEase DataFX automates battery servicing documentation by sending a report to a printer. It can be used by itself or with a computer and an independently marketed integration software.

The ProEase DataFX can be used with most charger-analyzers to measure and record battery data. The ProEase DataFX scans the battery cells during charge and discharge measuring the voltage at fixed intervals. The cell voltage, the total battery voltage, and the charge/discharge current are displayed on the liquid crystal display (LCD). If errors occur during processing, an LED warning light and an alarm will sound to alert the battery technician of a problem. The error type is displayed and the cells with the error flash on the display. An optional EPSON-compatible serial printer provides a complete report of the battery processing data and error conditions. Weak or defective cells can be identified immediately and corrective action taken before further damage to the battery occurs.

**CAUTION:** Using the DataFX does not relieve the technician of the responsibility of monitoring batteries. Do not leave batteries unattended for long periods of time (it is a good practice to check the battery at least every 1/2 hour). Always follow the battery manufacturer's servicing recommendations. The ProEase DataFX report provides information for an experienced technician to make battery servicing decisions.

For questions, comments or suggestions regarding the ProEase DataFX product or this manual, contact the Sales Department of MarathonNorco at the location on the title page of this manual.

## 2.0 SPECIFICATIONS

### Electrical Input

Voltage: 115/230 VAC, manually selected  
(90-135 or 200-265 VAC)  
Current: 0.03 amps, typical  
Frequency: 50/60 Hz  
Fuses: 0.25A 250V/T

### Electromechanical

Cell Probes: Spring loaded quick connect style  
Current Sensor: Current Shunt

### Data Outputs

Display: 4x40 character  
(Lo Profile upgrade: 2x20 character)  
Serial Printer: Dedicated RS-232 serial port  
Computer: Dedicated RS-232 serial port

### Mechanical

Height: 4.5 inches (11.43 cm)  
(Lo Profile upgrade: 4.5 inches or 11.43 cm)  
Width: 8 inches (20.32 cm)  
Depth: 9 inches (22.86 cm)  
Weight: 7 pounds, (3.2 kg) including harness

### Environmental

#### Non-operating conditions

Altitude: 0 to 40,000 feet  
Temperature: -20 to +75 degrees C  
Relative Humidity: 60% maximum

#### Operating conditions

Altitude: 0 to 8,000 feet  
Temperature: 0 to +50 degrees C  
Relative Humidity: 95% maximum

**3.0 EQUIPMENT/PARTS LISTS****STANDARD EQUIPMENT**

<b>Description</b>	<b>Part Number</b>
ProEase DataFX	121711-004
Cell Harness Assy, ProEase	121900-002
Cable Adapter DataFX Current	125000-001
6', 25 pin cable (for cell harness)	526250-001
12', RJ11 Printer Cable	526060-001
Adapter Plug, DB25	524600-041
AC Power Cord	526030-034
Operators Manual	TD-687
Support Arm Kit	121906-001

**UPGRADE OPTIONS**

ProEase DataFX, Lo Profile (No longer offered)	121711-005
ProEase DataFX, Hi Profile	121711-006

**OPTIONAL EQUIPMENT**

Serial Printer Kit	121470-001
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**REPLACEMENT PARTS**

LCD Assy, 4 X 40 (Large Display)	121932-001
PCB Assy, Hi-Accuracy, DataFX	121715-002
Keyboard, ProEase Data	121933-001
Bottom, DataFX (CE)	121789-002
Top Panel, ProEase DataFX	121930-001
Top Panel, DataFX AV	121790-002
Rear Panel, ProEase DataFX	121931-001
Rear Panel, DataFX AV	121791-002
Foot, Rubber	520650-007
Speed Nut, 6-32	515200-076
Screw, Button Head, 6-32 X 3/8	515500-172

#### 4.0 SAFETY SUMMARY

- 4.1 **BATTERY SAFETY:** The following battery safety guidelines are pertinent to battery service function. Please refer to the original battery manufacturer's manual for additional safety information and recommended battery servicing procedures.

**Shock hazard exists:** Batteries can deliver potentially lethal currents. Even lower voltage batteries can be dangerous. A potential shock hazard may exist across the battery terminals.

**Do not use metal implements around batteries:** Metal brushes, rings, watches, other jewelry, or uninsulated tools may cause an electrical short circuit resulting in extreme heat, serious burns, and battery damage.

**Battery electrolytes are corrosive liquids:** Avoid contact with any part of the body. Use rubber gloves, an apron and face shield when handling electrolyte chemicals. If electrolyte contacts skin, flush with large quantities of water. Neutralize acid (e.g. sulfuric acid) with baking soda. Neutralize caustic electrolytes (e.g. potassium hydroxide) with boric acid or vinegar.

**NOTE:**

Hydrogen is released when electrolytes are neutralized.

**Adequate ventilation is necessary when servicing batteries:** Assure free airflow around batteries. Do not smoke near charging or discharging batteries. Vented hydrogen and oxygen gasses may explode or burn. Do not allow these gases to concentrate in a confined space. Do not place batteries in airtight containers

- 4.2 **DataFX SAFETY:**

**WARNINGS:**

- Exercise extreme care when attaching cell probes to the inter-cell links. A short circuit between inter-cell links could result in arcing, extreme heat, serious burns and battery damage. If the inter-cell links are too small to safely attach the cell probes, then connect the cell harness as for a sealed battery (6.2.4).
- Do not expose to any liquid.

**Keep away from live circuits.**

Personnel must at all times observe safety regulations. Do not replace components or make adjustments inside the equipment with power connected. When power is connected, dangerous electrical potentials exist inside the unit.

**Do not service or adjust alone.**

Under no circumstances should anyone attempt to service or adjust the equipment except in the presence of someone who is capable of providing aid.

**Resuscitation**

Personnel working with or near high voltages should be familiar with methods of resuscitation and first aid.

**CAUTIONS:**

- If charging is allowed to continue after a "Negative Slope" error is detected, it could lead to thermal destruction of adjacent cells, or failure of the entire battery.
- When placing a shorting device (strap or resistor clips) across an individual cell, be careful not to damage the cell probes. These shorting devices can get very hot.
- Using the DataFX does not relieve the technician of the responsibility to monitor batteries. Do not leave batteries unattended for long periods of time (it is a good practice to check the battery at least every 1/2 hour). Always follow the battery manufacturers servicing recommendations. The DataFX report provides information for an experienced technician to make battery servicing decisions.
- The DataFX is set at the factory for 230 Volt operation. Set this switch to the appropriate position before turning the DataFX ON. If the 115 Volt position is selected, and the unit is connected to 230 Volts, serious damage to the unit will occur.

## 5.0 INSTALLATION

- 5.1 **INCOMING INSPECTION:** The DataFX has been tested and inspected prior to shipment. It is packaged in a box designed to protect the unit from damage. Open the box, and examine the contents for damage. In the event of damage, notify the transportation company at once for insurance inspection and claims. Save the original shipping box for future use. Check that all the standard items listed in Section 3 are present. Upgrade units consist of the DataFX unit, cell harness, and manual.

If any items are missing, contact MarathonNorco or an authorized Distributor immediately.

- 5.2 **PLACEMENT:** The DataFX may be placed on the bench or on top of a charger-analyzer.

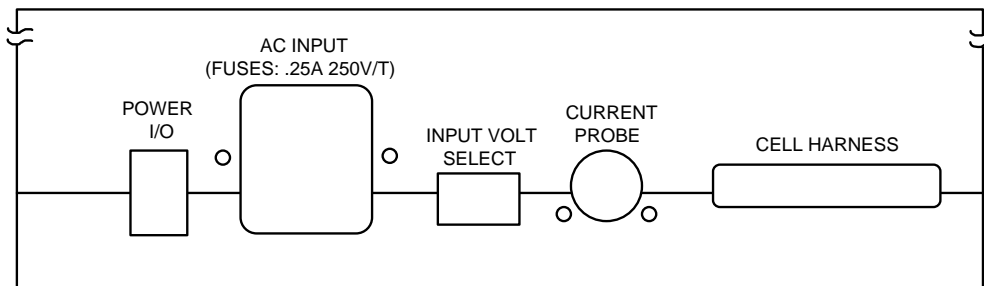
- 5.3 **CONNECTIONS & SETTINGS:**

### CAUTION:

**To protect the unit from accidental excess voltage, the DataFX is set at the factory for 230 Volt operation. If the 115 Volt position is selected and the unit is connected to 230 volts, serious damage will occur. Set the switch to the appropriate position before turning ON the DataFX.**

**If the Input Power Cord is damaged, replace it immediately with a cable of the same rating.**

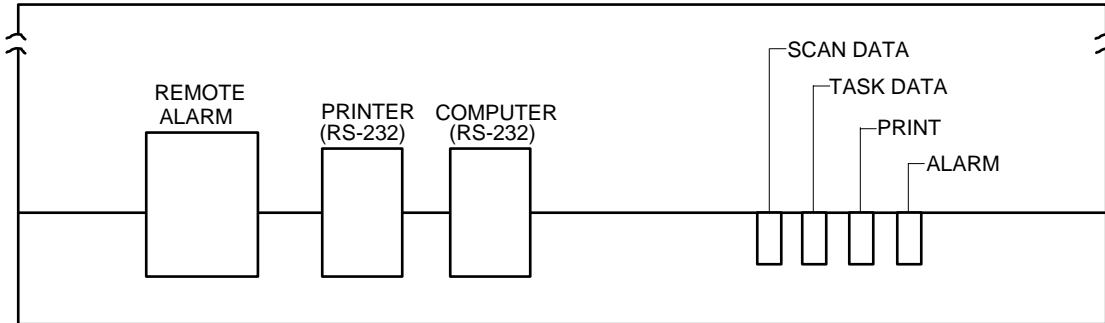
**Do not expose the DataFX to any liquid.**



- 5.3.1 AC INPUT - Install the AC Power Cord.
- 5.3.2 INPUT VOLT SELECT - Set to 115V or 230V before turning on the unit. See Caution above.
- 5.3.3 CURRENT PROBE - Attach the Current Cable Adapter signal connector to the DataFX.

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- 5.3.4 **CELL HARNESS CABLE** - Connect the 25 pin cable to the DataFX and connect the other end to the Cell Harness Block.



- 5.3.5 **REMOTE ALARM** - When an error is detected, the DataFX activates a relay that may be used to operate a remote alarm. The three green terminal connections on the left rear side of the DataFX may be used to switch an external warning circuit. This relay provides both normally open and normally closed contacts. The rear terminal is the common contact, the center is the normally closed contact, and the front terminal is the normally open contact. The relay is double pole, double throw, with one amp contacts.
- 5.3.6 **PRINTER (RS-232)** - Connect the modular (RJ-12) connector end of the printer cable to the DataFX. Connect the 25 pin "D-sub" connector adapter to the printer cable then connect to the Epson compatible serial printer.
- 5.3.7 **COMPUTER (RS-232)** - Connect the modular (RJ-12) connector end of the RS-232 cable to the DataFX and the other end to the computer serial port. Adapters are required to complete the connection to the serial port.
- 5.3.8 **SETTING THE SWITCHES:** There are four switches located on the left front side of the DataFX. The function and settings of these switches are listed below:

<u>Switch Name</u>	<u>Function</u>	<u>Up</u>	<u>Down</u>	<u>Factory Setting</u>
SCAN DATA	Send scan data to PC	On	Off	Up
TASK DATA	Send end of task data to PC	On	Off	Up
PRINT	Send end of task data to printer	On	Off	Up
ALARM	Audible alarm	On	Off	Up

- The end-of-task data is sent to the printer at 9600 baud.
- The alarm switch enables/disables the audible alarm when an error is detected. When the alarm is disabled (DOWN position), the red LED will still light and the Remote Alarm relay contacts still open/close when an error is detected.

- 5.4 CURRENT CABLE ADAPTER INSTALLATION: Connect the Current Cable Adapter between the charger-analyzer and battery. The sense leads is connected to the current probe of the DataFX.
- 5.5 CELL HARNESS ARM: Refer to Figure 1 (pg. 14) before assembling. Place the plastic washer between the halves of the arm. Fasten the arm together with the nut and bolt as shown. Mount the arm with four screws on a workbench (stationary) or on a board large enough to support a battery (mobile). Make sure the placement of the arm does not interfere with other equipment.
- 5.6 PRINTER SET-UP: The DataFX serial printer output is in Epson FX format. Any printer capable of emulating the Epson format can print the DataFX report. Connect the printer end of the RS-232 cable to the serial printer and configure the printer for:
- 9600 Baud
  - no parity bit
  - 8 data bits
  - 1 stop bit
  - no auto line feed after carriage return

Follow the instructions in the Printer Manual for configuring the printer to the above parameters.

- 5.7 CONFIGURING THE DataFX FOR MULTIPLE UNIT OPERATION: When several DataFX units share a common printer (with a print-share device) or interface to a computer, each unit must have its own Station Number. The Station Number of the DataFX will be shown on the display's opening message (6.5.1) and printed on the battery servicing report in the upper right corner (see page 17).

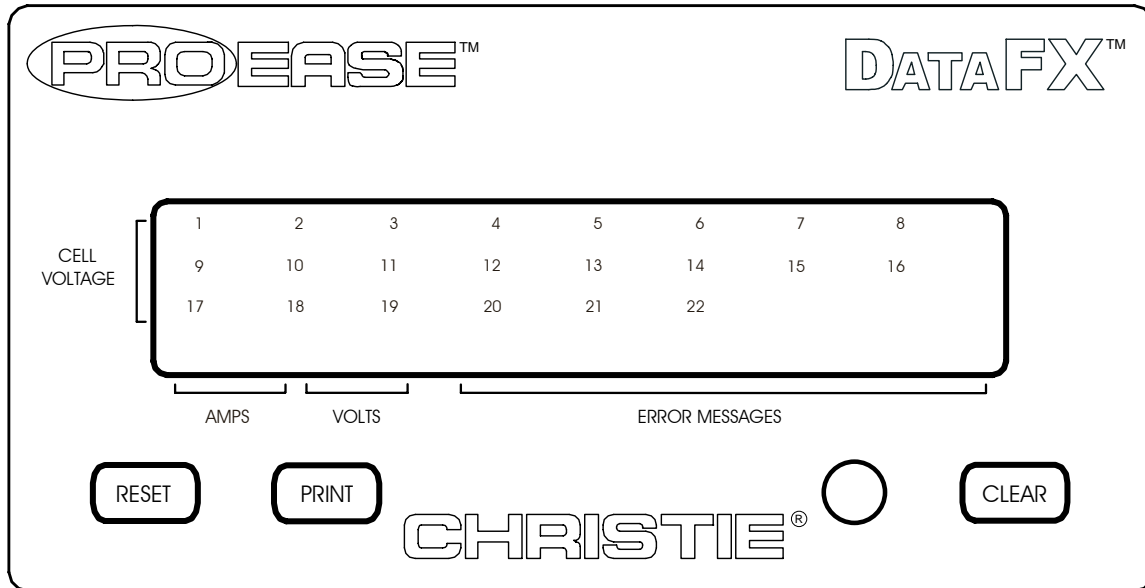
Set the Station Number by adjusting the two rotary switches on the rear panel. The left switch sets the 1st digit and right switch sets the 2nd digit. Turn the DataFX ON and verify that the correct Station Number is displayed on the opening message.

- 5.8 COMPUTER INTERFACE: The DataFX Computer Interface Port is located next to the Printer Port. The interface is RS-232, 9600 baud. The data transmitted is in ASCII format, and consists of the “end of task” (the Task Data switch is UP) and/or “cell scan data (The Scan Data switch is UP).” Software for computer system integration is available from an independent source.



- 5.9 PREPARATION FOR SHIPMENT OR STORAGE: To ensure adequate protection use standard procedures in preparing the DataFX for shipment or storage. If possible, use the original factory shipping box.

## 6.0 OPERATION



### 6.1 THE FRONT PANEL:

The front panel is designed to present a continuous display of the battery cell voltage status during charge or discharge. Cell numbers are printed next to the cell voltages. The three buttons provide the following functions:

6.1.1 **RESET BUTTON:** This button resets and clears all battery data. Press each time a new task begins and verify cell count (6.5.2). Do Not press this button to clear errors. This will reset the DataFX, and all battery servicing data will be lost.

6.1.2 **PRINT BUTTON:** The PRINT button prints a cell voltage report before or during a task, and reprints a prior report. Pressing this button provides the following results when the DataFX is connected to a battery and printer:

- Press and hold for 1 second before or after current is flowing to print a cell voltage report. This report eliminates the need for the technician to measure and write down each cell voltage reading.
- Press and hold for 3 seconds to reprint the prior report (either cell volts or the End-Of-Task report). This feature ensures the End-Of-Task report will be captured and not lost due to printer malfunction. The prior report is stored until the RESET button is pressed or until the unit is turned OFF.

The DataFX will print an End-Of-Task report when the current goes to zero or passes through zero (as in an Analyze function on the RF80-K).

The Lo Profile upgrade does not have the PRINT button features.

- 6.1.3 **CLEAR BUTTON:** This button has two functions; to clear cell errors during a task, and to zero the current offset (9.3).
- Press to clear errors as they occur. The cell voltages will stop flashing, the error description will clear, and the LED and alarm (if enabled) will turn off.

**NOTE:** Pressing this button when current is flowing and no errors are present will reset the amp value to zero. Thus, all current readings will be off by the amount of the current flowing when the CLEAR button was pressed.

- 6.2 **EQUIPMENT REQUIRED:** DataFX, cell harness, charger-analyzer, serial printer, and an aircraft battery. Power: 115VAC or 230VAC, 50/60 Hz

Place all equipment to be safely and conveniently accessed by the technician.

6.3 **SETUP:**

- 6.3.1 To assure reliable electrical contact between the battery's inter-cell links and DataFX cell probes, thoroughly clean and dry the aircraft battery. For specific information, refer to the battery manufacturer's recommended cleaning and safety procedures.

- 6.3.2 Connect the battery to the charger-analyzer.

**WARNING:** Exercise extreme care when attaching cell probes to the inter-cell links. A short circuit between inter-cell links could result in arcing, extreme heat, serious burns and battery damage. If the inter-cell links are too small to safely attach the cell probes, then connect the cell harness as for a sealed battery.

**Do not expose to any liquid.**

**NOTE:** The cell probes must be kept clean to assure reliable electrical connections to the inter-cell links. After removing the probes from a battery, inspect and clean with a stiff brush to remove oxidation, as required.

- 6.3.3 Connect the DataFX cell probes to the battery: (See Figure 1)

**Batteries With Accessible Cell Links** (e.g. nickel-cadmium):

- a. Attach the black cell probe to the negative battery terminal.

- b. Attach the numbered red cell probes in sequence (from 1-22) to the inter-cell links, following the battery circuit from **negative to positive**.

**Batteries With Inaccessible Or Small Cell Links:** (e.g. lead-acid)

- a. Attach the black cell probe to the negative battery terminal.
  - b. Attach red cell probe #22 to the positive battery terminal. Do not attach probes 1-21.
  - c. The DataFX will display the voltage for the entire battery in the Volts section of the display and in the cell 22 position.
- 6.4 Turn the DataFX ON and allow it to warm-up for a minimum of 5 minutes. In a very cold environment, the warm-up period should be extended.
- 6.5 Turn the Printer ON, verify all connections, and that it is on-line.
- 6.5.1 The following opening message should appear on the DataFX display:

```
ProEase Rev:2.00.00  
STA:XX CELS=XXDataFX
```

(XX represents the station number or the number of cells of the battery.)

- 6.5.2 Verify that the correct station number (5.7) and the proper number of cells are displayed in the opening message. If the wrong number of cells is displayed, check the cell count, cell probe numbering, and connections. Press RESET.
- 6.6 Start the charger-analyzer. The DataFX begins monitoring when a current of about 1 to 2 amperes is detected.

**NOTE:**

**If a cell is reversed (electrically or physically) or the cell probes connected across that cell are reversed, the DataFX will scan only the cells up to the reversal and not the remaining cells.**

**If this occurs, turn the charger-analyzer and DataFX OFF. Verify that the numbered red cell probes are connected in sequence (1-22) to the inter-cell links from negative to positive (6.3.3). Also, check for cells that have been installed backward or have electrically reversed polarity. Take corrective action as described in the battery manufacturer's manual.**

**6.7 BATTERY MONITORING:**

6.7.1 The DataFX will display the individual cell voltages and the battery terminal voltage and current (charge/discharge). The DataFX is a sampling device and does not provide a real time display. However, voltage and current are sampled several times per minute. Use the charger-analyzer ammeter display for charge/discharge current adjustments. The DataFX will display the adjustment to current at the next update interval.

6.7.2 CURRENT DISPLAY & AMP-HOUR CALCULATION FOR ReFLEX CHARGING: The ProEase DataFX reads the DC average of the ReFLEX current waveform and the MarathonNorco RF80 series charger-analyzer ammeter displays indicate the peak current during ReFLEX charging. On the DataFx printout, the resulting ampere-hour calculation during a charge will appear lower when compare to amp-hour calculation of the RF80 series charger.

Also, the RF80 series charger-analyzers measure the battery voltage at zero current. The ProEase DataFX reads the DC average of the ReFLEX wave. Therefore, the DataFX may show a higher reading than the RF80.

6.7.3 The DataFX will automatically monitor the battery for error conditions during a Task and print the End-Of-Task report when the Task has ended. If an error condition is detected, the red LED, alarm, and the display will show the error message and cells effected. At any time during the task, press the PRINT button for a cell voltage printout or set the current to zero amps for a full End-Of-Task report.

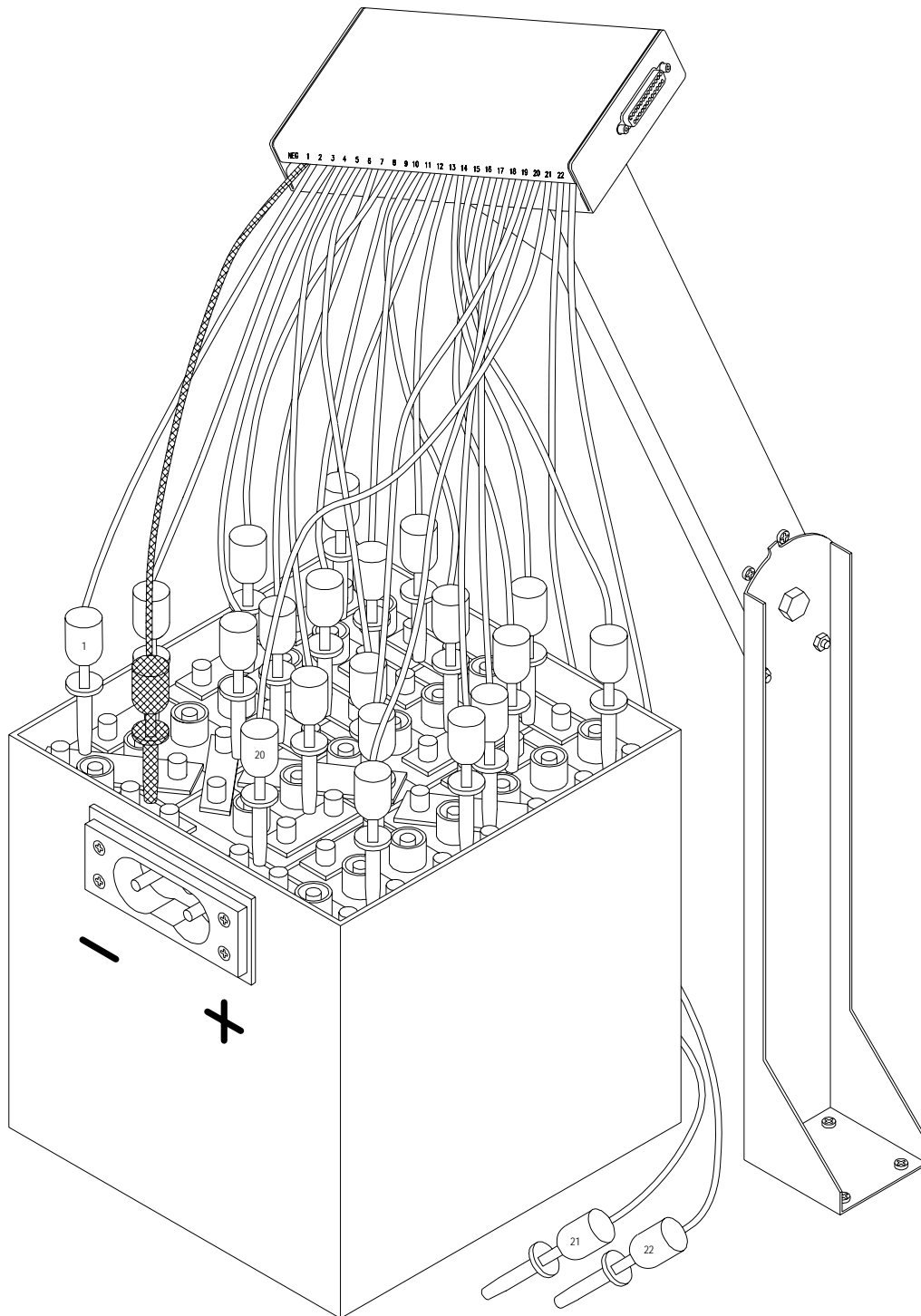


Figure 1: Cell Harness Arm Assembly (5.5) And Probe Sequence (6.3.3).

## 7.0 ERROR MESSAGES

### 7.1 UNDERSTANDING ERROR MESSAGES:

The DataFX monitors four error conditions:

- CR - cell reversed (7.4)
- CB - cell balance (7.5)
- NS - negative slope (7.6)
- LV - low cell volts (7.7).

When an error condition occurs, the cell voltage for that cell will flash on the display, the warning LED will come on, and the alarm may sound to alert the technician of the error. Each error is reported once per cell per task.

Table 1: Errors Defined

<u>ERROR TYPE</u>	<u>PARAMETER MEASURED</u>	<u>ERROR LIMITS</u>
CR Cell Reversed	Cell polarity	Wrong polarity of cell (physically or electrically)
CB Cell Balance	Cell voltage	0.10 Volt variance of average cell voltage
NS Negative Slope	Rate of cell voltage change	Cell below 0.10 Volt of peak charge during charge
LV Low Cell Volts	Cell voltage	Cell voltage drops below 0.75 Volt during discharge

### 7.2 CLEARING ERROR MESSAGES:

**NOTE: Do not press RESET to clear error messages. Pressing RESET will empty all acquired data!**

Press the CLEAR button to clear an error. Clearing the error shuts off flashing cell volts, the alarm, and warning LED. The error will be recorded by the DataFX and appear on the printout. If a different error occurs later, it will be displayed and the alarm will activate again.

**7.3 DISABLING THE ALARM:**

Set the switch for ALARM in the DOWN position (5.3.8) to disable the alarm. With this setting only the warning light will alert the technician of an error condition. Refer to paragraph 5.3.5 for information about the Remote Alarm.

**7.4 CELL REVERSED ERROR: (CR)**

This error occurs when the cell has reversed polarity during discharge, one or more red cell probes are improperly connected, or an individual cell is installed in reverse polarity.

**7.5 CELL BALANCE ERROR: (CB)**

**NOTE: Cell balance error detection is automatically disabled in discharge after the "critical time" cell voltage reading (8.4).**

This error occurs when a cell that is not within 0.10 volt of the average cell voltage for the battery is detected.

**7.6 NEGATIVE SLOPE ERROR: (NS)**

**CAUTION: If charging is allowed to continue after a "Negative Slope" error is detected, thermal destruction of adjacent cells, or failure of the entire battery may occur.**

This error indicates that a cell has dropped below its peak charge by 0.1 volts (or more). This could indicate a defective/overheated cell, an overcharged condition, or a damaged gas barrier membrane.

**7.7 LOW CELL VOLTS ERROR: (LV)**

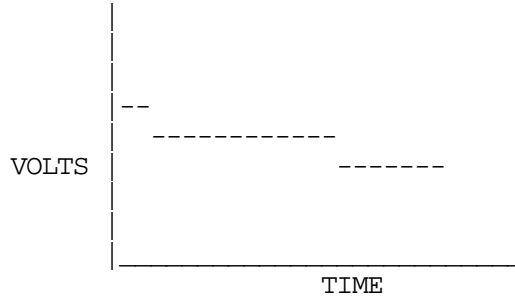
This error indicates that a cell has dropped below 0.75 volts during a discharge.



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STATION: 01  
DISCHARGE

FACILITY NAME: \_\_\_\_\_  
 CERTIFICATE NO: \_\_\_\_\_  
 CHARGE METHOD: \_\_\_\_\_  
 TECHNICIAN: \_\_\_\_\_  
 CERTIFICATE NO: \_\_\_\_\_  
 WORK ORDER NO: \_\_\_\_\_  
 BATTERY TYPE: \_\_\_\_\_  
 SERIAL NO: \_\_\_\_\_  
 RATED AMP-HOUR: \_\_\_\_\_  
 FUNCTION/MODE: \_\_\_\_\_  
 CHARGE METHOD: \_\_\_\_\_



BATTERY SUMMARY

```
-----
CRITICAL AH:      04.5   PEAK CURRENT:    -20.40   START VOLTAGE:    25.21
AMP-HOUR:         0.68   ELAPSED TIME:     00:20   END VOLTAGE:      19.00
-----
```

ERROR MESSAGES

CELL VOLTAGES

HISTORY

```
-----
                                TIME 00:00  00:13  00:20
LOW CELL VOLTS:                CELL  START  CRITICAL  END  ELAPSED  BATTERY  BATTERY
--- -- 03 --- -- -- -- -- -- NO  VOLTS  AMP-HR  VOLTS  TIME     VOLTS   AMPS
--- -- -- -- -- -- -- -- -- 01  1.26   1.08   0.98  00:00   25.21  -10.5
--- -- -- -- -- -- -- -- -- 02  1.26   1.06   0.99  00:01   23.34  -20.4
--- -- -- -- -- -- -- -- -- 03  1.26   1.13  -0.22  00:02   22.96  -20.4
NEGATIVE SLOPE                 04  1.26   1.09   1.06  00:03   22.77  -20.4
--- -- 03 --- -- -- -- -- -- 05  1.27   1.11   1.08  00:04   22.57  -20.4
--- -- -- -- -- -- -- -- -- 06  1.27   1.14   1.12  00:05   22.48  -20.3
--- -- -- -- -- -- -- -- -- 07  1.27   1.12   1.07  00:06   22.32  -20.3
--- -- -- -- -- -- -- -- -- 08  1.27   1.10   1.05  00:07   22.20  -20.3
CELL BALANCE:                  09  1.25   1.05   0.99  00:08   22.08  -20.3
-- -- 03 04 05 06 07 08 10  1.26   1.01   0.98  00:09   21.93  -20.3
-- -- 11 12 13 -- 15 16 11  1.27   1.13   1.10  00:10   21.80  -20.3
17 -- 19 --                    12  1.27   1.12   1.08  00:11   21.67  -20.3
--- -- -- -- -- -- -- -- -- 13  1.25   0.99   0.91  00:12   21.53  -20.3
CELL REVERSED                  14  1.25   1.06   1.01  00:13   21.35  -20.3
--- -- 03 --- -- -- -- -- -- 15  1.25   0.93   0.83  00:14   21.20  -20.3
--- -- -- -- -- -- -- -- -- 16  1.24   0.96   0.88  00:15   21.04  -20.3
--- -- -- -- -- -- -- -- -- 17  1.27   1.10   1.05  00:16   20.85  -20.3
--- -- -- -- -- -- -- -- -- 18  1.25   1.03   1.00  00:17   20.65  -20.3
COMMENTS:                      19  1.28   1.17   1.15  00:18   19.86  -20.3
--- -- -- -- -- -- -- -- -- 20  1.25   0.97   0.89  00:19   19.18  -20.3
--- -- -- -- -- -- -- -- -- 21  0.00   0.00   0.00  00:20   19.00  -20.3
--- -- -- -- -- -- -- -- -- 22  0.00   0.00   0.00
-----
```

TOTAL 25.21 21.35

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## 8.0 READING THE PRINTOUT

The DataFX prints the key data acquired during charge or discharge. This report documents individual cell voltages, error conditions, amp-hours, charge/discharge rate, and battery history. **The DataFX does not produce a print-out when the total elapsed charge or discharge time is 5 minutes or less.**

- 8.1 **HEADER:** The area at the upper left of the printout is provided to record facility and battery information. The station number is printed in the upper right corner.
- 8.2 **GRAPH:** This is a graph of battery voltage over time, and shows the performance trend over time of the battery. Each battery chemistry has its own 'normal' curve. For example, a nickel-cadmium battery should be flat, with a sudden drop off at the end of a discharge; while a lead-acid battery appears more linear. An irregular shaped discharge curve may indicate a "memory" (fading) condition or severe cell imbalance.
- 8.3 **BATTERY SUMMARY:** The battery summary area contains the battery information from the completed charger-analyzer function.
- 8.3.1 **CRITICAL AH:** After discharge, the CRITICAL AMP-HOURS are calculated based on the discharge current (in amps) multiplied by the elapsed time (in hours) when the weakest cell reached end of capacity (0.95 volts). Battery manufacturers generally recommend that all cells within a battery should be at or above 1.00 volts when the elapsed discharge time corresponds to the minimum desired ampere-hour capacity (usually 85% to 100% of nominal). If the critical amp-hour state wasn't reached, then this field is left empty.
- 8.3.2 **AMP-HOURS:** After charge or discharge, the AMP-HOURS are calculated based on the charge or discharge current (in amps) multiplied by the total elapsed time (in hours).
- 8.3.3 **PEAK CURRENT:** This is the peak current during the task excluding the first two minutes (to eliminate start-up spike errors).

**NOTE:** The peak current of the ProEase DataFX when the RF80 series charger analyzers is operated in the ReFlex mode is defined as the DC average of the ReFLEX current waveform.

- 8.3.4 **ELAPSED TIME:** The ELAPSED TIME is the total charge or discharge time.



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- 8.3.5 START VOLTAGE: The START VOLTAGE is the total battery voltage after two minutes (to eliminate start-up transient errors).
- 8.3.6 END VOLTAGE: The END VOLTAGE is the total battery voltage at the end of charge or discharge.

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STATION: 01  
CHARGE

FACILITY NAME: \_\_\_\_\_  
 CERTIFICATE NO: \_\_\_\_\_  
 CHARGE METHOD: \_\_\_\_\_  
 TECHNICIAN: \_\_\_\_\_  
 CERTIFICATE NO: \_\_\_\_\_  
 WORK ORDER NO: \_\_\_\_\_  
 BATTERY TYPE: \_\_\_\_\_  
 SERIAL NO: \_\_\_\_\_  
 RATED AMP-HOUR: \_\_\_\_\_  
 FUNCTION/MODE: \_\_\_\_\_  
 CHARGE METHOD: \_\_\_\_\_

VOLTS

TIME

BATTERY SUMMARY

-----  
 CRITICAL AH:     --.-     PEAK CURRENT:     21.80     START VOLTAGE:     23.75  
 AMP-HOUR:        40.9     ELAPSED TIME:     01:54     END VOLTAGE:       30.44

ERROR MESSAGES

CELL VOLTAGES

HISTORY

	TIME	00:00		01:54			
LOW CELL VOLTS:	CELL	START	HIGHEST	END	ELAPSED	BATTERY	BATTERY
		VOLTS	VOLTS	VOLTS	TIME	VOLTS	AMPS
	NO						
	01	1.20	1.48	1.47	00:05	27.42	21.5
	02	1.20	1.49	1.48	00:10	27.78	21.4
	03	1.22	1.49	1.49	00:16	28.36	21.5
NEGATIVE SLOPE	04	1.22	1.49	1.48	00:21	28.28	21.5
	05	1.22	1.49	1.49	00:27	28.64	21.5
	06	1.23	1.69	1.68	00:32	28.77	21.5
	07	1.22	1.51	1.51	00:38	28.88	21.4
	08	0.98	1.49	1.48	00:43	28.48	21.4
CELL BALANCE:	09	1.21	1.50	1.49	00:48	29.02	21.5
	10	1.22	1.66	1.65	00:54	28.71	21.5
	11	1.23	1.51	1.51	00:59	29.01	21.8
	12	1.22	1.61	1.61	01:05	28.91	21.8
	13	1.18	1.46	1.45	01:10	29.30	21.8
CELL REVERSED	14	1.22	1.51	1.51	01:16	29.32	21.8
	15	1.17	1.50	1.49	01:21	29.07	21.8
	16	0.94	1.47	1.46	01:27	29.00	21.6
	17	1.22	1.51	1.51	01:32	29.29	21.8
	18	1.21	1.51	1.50	01:38	29.63	21.6
COMMENTS:	19	1.24	4.69	1.68	01:43	29.81	21.5
	20	1.19	1.51	1.50	01:48	30.20	21.3
	21	0.00	0.00	0.00	01:54	30.44	21.4
	22	0.00	0.00	0.00			

TOTAL 23.75

REPORT PRINTED BY CHRISTIE ELECTRIC CORP. PROEASE DATAFX (S/W VER. 02.00.00)

- 8.4 **ERROR MESSAGES:** All errors detected during battery processing are recorded for review and corrective action. See 7.1 for a description of the errors.
- 8.5 **CELL VOLTAGES:** Table 2 shows the meaning of the Cell Voltages columns during a charge or discharge.

**Table 2**

**Cell Voltages - Charge**

TIME 00:00 START VOLTS	Initial Voltages Measured At The Beginning Of The Cycle.
HIGHEST VOLTS	Peak Voltage Of Each Cell. There Is No Time For This Column.
TIME XX:XX END VOLTS	End Voltages Measured At The End Of Charge With The Recorded End Time.

**Cell Voltages - Discharge**

TIME 00:00 START VOLTS	Initial Voltages Measured At The Beginning Of The Cycle
TIME XX:XX CRITICAL AMP-HR	Cell Voltages When Weakest Cell Reaches 0.95V. The Time This Occurs Is Recorded.
TIME XX:XX END VOLTS	End Voltages Measured At The End Of Discharge With The Recorded End Time.

- 8.6 **HISTORY:** This table shows the elapsed time, battery volts, and current in amps at scaled intervals during charge or discharge. Up to 20 battery history readings are displayed. This data is the numeric information of the graph. The examples shows 21 readings. Time starts from 00:00 and is entry #1.
- 8.7 **CELL DATA REPORT:** This report shows the battery and cell data when the PRINT button is pressed. This report may be generated after the RESET button has been pressed and before the End-Of-Task.



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The first line of data shows the battery volts, the current in amps, and the elapsed time in hours and minutes. The remaining three lines of data show the cell numbers and cell volts.

The first example shows the cell data (of a 20 cell battery) before a task has begun. Note the current is 00.0 A; and the elapsed time is 00:00.

```
Christie Electric - ProEase DataFX - Cell Report
25.2 V; 00.0 A; E.T. 00:00
01: 1.26; 02: 1.26; 03: 1.26; 04: 1.26; 05: 1.27; 06: 1.27; 07: 1.27; 08: 1.27;
09: 1.25; 10: 1.26; 11: 1.27; 12: 1.27; 13: 1.25; 14: 1.26; 15: 1.25; 16: 1.24;
17: 1.27; 18: 1.25; 19: 1.28; 20: 1.25; 21: 0.00; 22: 0.00
```

The second example shows the cell data (of a 20 cell battery) after a discharge task has begun. Note the current has a value of -20.4 A; and the elapsed time is 00:02.

```
Christie Electric - ProEase DataFX - Cell Report
22.7 V; -20.4 A; E.T. 00:02
01: 1.15; 02: 1.13; 03: 1.18; 04: 1.15; 05: 1.17; 06: 1.19; 07: 1.17; 08: 1.16;
09: 1.11; 10: 1.06; 11: 1.19; 12: 1.17; 13: 1.13; 14: 1.13; 15: 1.08; 16: 1.09;
17: 1.16; 18: 1.08; 19: 1.21; 20: 1.06; 21: 0.00; 22: 0.00
```

## 9.0 MAINTENANCE & CALIBRATION

### 9.1 SAFETY

Below are general safety precautions that are not related to a specific procedure and appear only in this section of the manual. These are recommended precautions that battery service technicians must understand and apply during maintenance and calibration.

**WARNING:**

**Keep away from live circuits. Personnel must observe all safety regulations at all times. Do not replace components or make adjustments inside any equipment with power connected. When active, dangerous potentials exist inside the unit.**

**Do not service or adjust alone. Under no circumstances should anyone attempt to service the equipment except in the presence of someone who can assist with or give first-aid.**

**Resuscitation Personnel working with or near high voltages should be trained with methods of resuscitation and first-aid.**

### 9.2 MAINTENANCE:

**NOTE: The cell probes must be kept clean to assure good electrical connection to the inter-cell links. After each removal from a battery, inspect and clean with a stiff brush as needed to remove oxidation.**

The DataFX input/output connections, cables, and cell voltage harness block should be inspected for corrosion at least once per year. The cell probes require regular cleaning with a stiff brush.

9.2.1 **ADJUSTING DISPLAY CONTRAST:** The display was adjusted at the factory for normal ambient lighting, and should not require adjustment. If adjustment is necessary, use standard safety and ESD precautions. The DataFX must be ON while the display is being adjusted.

To adjust the display:

1. Remove the top cover.
2. Turn ON the DataFX.
3. Locate, and adjust potentiometer R21 (between J8 and the switches) until the display is clear and background is not visible.
4. Turn OFF the DataFX and replace the top cover.

### 9.3 CALIBRATION

The calibration adjusts the DataFX current offset to zero. Voltage is controlled by precision components and circuitry. The offset calibration should be performed each time the DataFX is used.

**NOTE: Before performing the offset calibration, turn the DataFX ON and allow a five minute warm-up. The following steps should be performed in the sequence listed.**

#### 9.3.1 EQUIPMENT LIST:

ProEase DataFX	Serial Printer
Charger Analyzer	Battery

#### 9.3.2 OFFSET ADJUSTMENT:

This sets the DataFX current sensor to zero amps. Note: there is no confirmation of this on the DataFX display.

- a. Turn ON the charger analyzer, set to zero amps, and allow it to warm-up.
- b. Connect one end of the Current Cable Adapter (5.4) to the charger-analyzer and the other end to the battery. Attach the current probe (5.3.3) of the Current Cable Adapter to the DataFX.
- c. Attach the Cell Harness to the battery (6.3.3) and the DataFX.
- d. Turn ON the DataFX and allow it to warm-up for five (or more) minutes.
- e. Verify the Station Number and battery Cell Count (6.5.2).
- f. Turn the DataFX OFF for 15-30 seconds.
- g. Verify that zero (0.00) amps of current is flowing to or from the battery.
- h. Turn ON the DataFX.
- i. When the opening display appears, press the CLEAR button and hold for one second minimum.
- j. Verify the adjustment by pressing the PRINT button. The amp value should read 00:0 A. If it has a non zero value (e.g. 00.2 A), repeat the above steps until the printed amp value is 00:0A.

The Lo Profile upgrade does not have this PRINT button feature. To verify 'zero' current is true, disconnect the Current Cable Adapter (5.4) to the charger-analyzer. The DataFX should remain inactive. If the 'zero' current is false (and greater than one amp), then DataFX will report a negative current.





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**WARNING: Do Not press the CLEAR button when current is flowing except to clear errors. Pressing it will reset the 'zero' of the current offset. The current measurements will be off by the amount of current that was flowing when the button was pressed.**

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